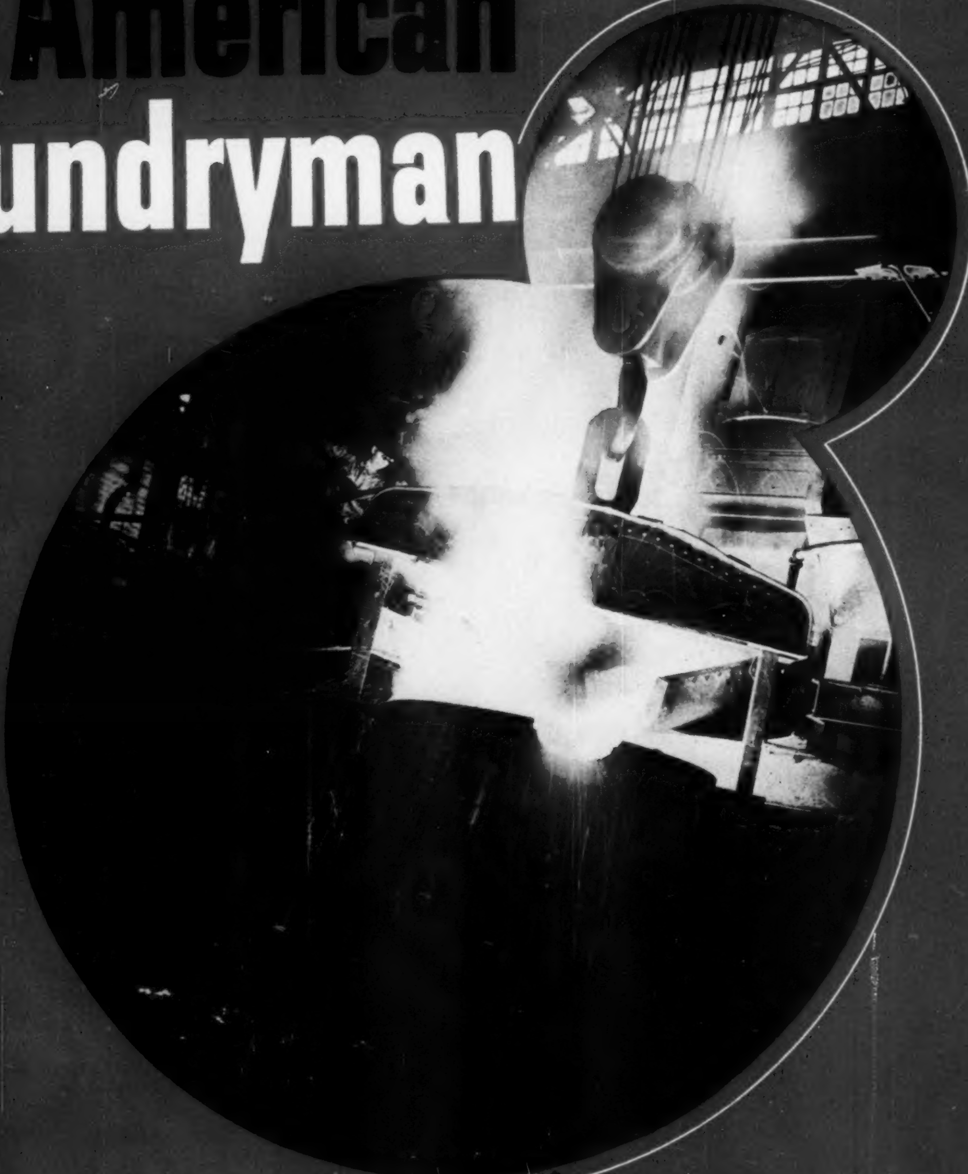
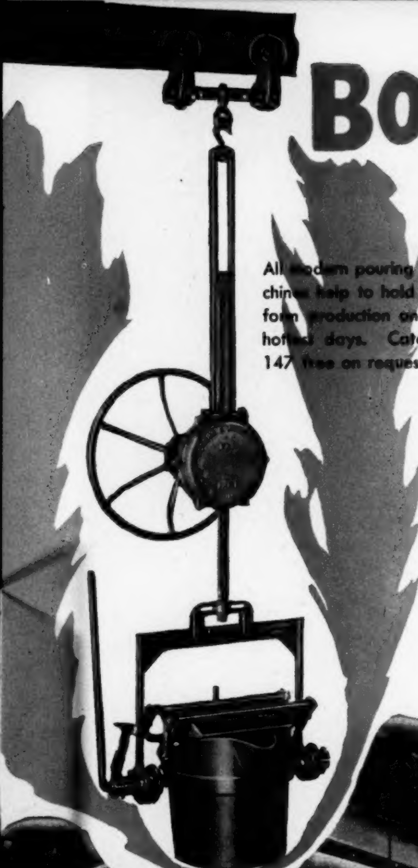
American Foundryman



The Foundrymen's OWN Magazine • March 1951

BORN IN A FOUNDRY



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VOLUME XIX, NUMBER 3

March, 1951

American Foundryman

Official publication of American Foundrymen's Society

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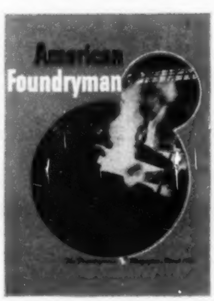

Tapping a 27-ton basic open hearth furnace into a bottom pour ladle at Symington-Gould Corp., Depew, N.Y. This plant, with four open hearth furnaces, is one of a number which will be open for visitation during the 55th Annual A.F.S. Convention in Buffalo, N.Y., April 23-26. At Symington-Gould foundrymen can see production of steel railroad castings—couplers, side frames, bolsters, draft gear, snubbers, and journal boxes.

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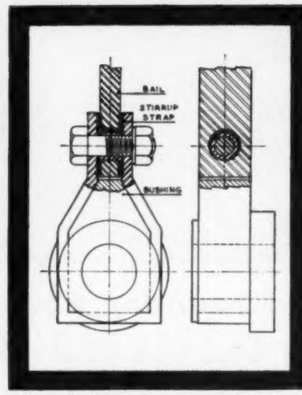

More flexibility than a universal joint. Ample vertical and horizontal adjustments. Misalignment taken care of by rotating swivel action.

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Look to Industrial Equipment for the really basic improvements in foundry pouring and handling equipment. *Write, wire, or telephone today for full details.*

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ON METAL PROBLEMS

On January 1, 1951, National Production Authority Order M-14 respecting the consumption of primary nickel went into effect and subsequent amendments limit the applications for which nickel and its alloys may be used.

Within these limitations, we shall continue to issue information on new developments and user experience with nickel-containing materials, as we believe that dissemination of technical data and service experience can help to promote the intelligent utilization of critical materials, so essential in these times.

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Consultation on technical problems relating to alloys containing nickel is invited. Consult the nearest Technical Field Section of INCO Development and Research Division listed below:

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THE INTERNATIONAL NICKEL COMPANY, INC.

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

High-Chromium, High-Carbon Iron

. . . the Iron That Hardens as it Wears

In many applications involving extreme abrasion, ordinary work-hardening alloys are not suitable. This is because most of these alloys require a definite pounding action for a martensite transformation, and the scouring action of an abrasive is not sufficient for development of high wear resistance. For this reason, high-chromium, high-carbon irons were developed – irons that wear-harden.

Chromium Content of Irons Ranges from 24 to 30 Per Cent

These irons are made in the electric furnace and have the following composition range:

Chromium	24 to 30 per cent
Carbon	2.25 to 2.85 per cent
Manganese	0.50 to 1.25 per cent
Silicon	0.50 to 1.50 per cent
Nickel	minimum
Iron	balance

Irons of this composition are readily castable by steel casting techniques.

Development of Greater Wear Resistance by Heat Treatment

Structurally, these irons consist of primary iron-chromium carbides in a matrix of iron-chromium solid solution and secondary iron-chromium carbides. They are hard in the as-cast condition (500 to 550 Brinell), but when they are given an austenitization heat-treatment they develop much higher hardness (about 600 Brinell), and also have greatly improved wear resistance. Austenitization consists of heating these irons to a temperature of about 2012 deg. F. for an hour, then allowing them to cool in air. This heat-treatment promotes the formation of very unstable austenite—austenite that will transform to a harder martensitic end-product even under rubbing or mild impingement action. Austenitization has been found to be far more effective in increasing wear resistance than the promotion of unstable austenite by the addition of ferrite-forming alloying elements.

High-chromium, high-carbon irons can also be annealed to sufficiently low-hardness values for grinding or simple machining. Hardnesses as low as 350 to 450 Brinell can be obtained by heating the castings to temperatures of 1400 to 1450 deg. F. for 12 to 24 hours, then allowing them to cool in air.

Irons Have Wear Resistance Many Times That of Other Alloys

Austenitized high-chromium irons have been known to last as much as 21 times longer than other wear-resistant alloys in applications involving extreme frictional abrasion. These applications include sandblast nozzles and liners, pantograph contact shoes, grinding disks, pulleys, chute-liner plates, dredge-pump liners, and rollers for crushing various hard materials.

In a recent test, high-chromium iron was compared to special wear-resistant steel castings as the material for hammers in a machine that was used to crush abrasive material. The chrome-iron hammers were found to have almost 7 times the wear resistance of the steel castings.

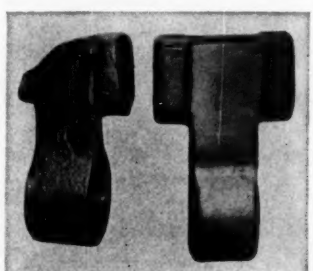


Fig. 1. After crushing the same amount of abrasive material in a hammer mill, the badly worn steel casting (left) had a weight loss of 37 per cent while the high-chromium iron casting (right) lost only 5.5 per cent.

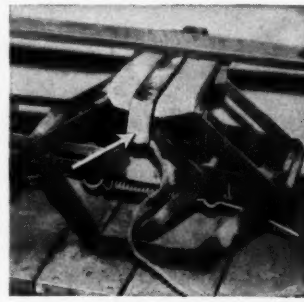


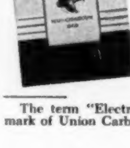
Fig. 2. This chrome-iron pantograph shoe had a service life of about 10 years. A tool steel that was used in similar service wore out in about 3 or 4 months; copper lasted about 24 hours.

When thoroughly backed up with zinc, the iron also has enough shock resistance to be used effectively as crushing hammers and jaw plates for many severe rock-handling jobs.

Metallurgical Service Available

For years, Electromet high-carbon ferrochrome has been used to make chromium additions to abrasion-resistant high-chromium irons. If you should have any questions about either the production or use of these irons, write to the nearest Electromet office. Our metallurgists will be glad to give many valuable suggestions and recommendations on how to make or use this iron most effectively.

Write for a free copy of the Electromet publication, "Abrasion-Resistant High-Chromium Iron." This booklet is a collection of some of the best available information on how to make and to use abrasion-resistant iron castings most efficiently.

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with ★ STARRBIDE
Slag Hole Blocks

75% FASTER

CONTROLLED MULLING OF CORE SAND

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Mr. Carl Johnson, Plant Superintendent of Stemac, Inc., writes: "Previously our method in preparing core mix required at least 24 minutes time. With the *Porto-Muller,* this operation is accomplished in 6 or 7 minutes, *thus effecting a savings in labor and utility of 75%.*

Like many progressive foundries, Stemac, Inc., has found that a Simpson *Porto-Muller* means faster, more thorough mulling of sand and binder. ". . . core surfaces are much smoother." The result—more castings, less rejects.

The *Porto-Muller* is completely self-contained and portable. The 300-lb. capacity mixer with spring-adjusted mullers, and the 3 H.P. motor, are compactly mounted on pneumatic tires for easier handling. Simply roll the unit up to a sand pile—load—start mulling.

Let a National Engineer show you how a Simpson Porto-Muller *can boost your output.*

View of the Simpson Porto-Muller discharging batch into a wheelbarrow.

Complete information about the Simpson Porto-Muller is contained in Bulletin 492. Write for your copy today.

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SOCIETY'S MEMBERS AID IN PLANNING A.F.S. HOUSING PROJECT

Great interest evidenced by supporters of the A.F.S. Housing Project in the form of suggestions and criticisms has been one of the finest experiences of the Project's Housing Committee during its solicitation of funds in recent months. Almost all of the suggestions made have been constructive and touch upon matters already considered by the A.F.S. Board of Directors who implemented the Project. Heretofore, many of these suggestions could not be adopted, nor could criticisms be answered, and a complete and finalized program could not be decided upon. Nor can this be done until the Committee and Board consider thoroughly "when, where and what to build or buy."

Some of the pertinent and timely suggestions offered, and questions asked, concern these points:

(1) High current cost of construction.

(2) Should the total fund be $100,000 or $200,000?

(3) Should the Project be financed completely by funds presently being acquired, or should it be financed wholly or in part by deficit or sinking fund?

(4) Is a location in a smaller community, or in a suburban area away from a congested business center preferable to that in a large city?

(5) Time of acquisition or construction.

(6) Recommendations as to architectural, structural and functional aspects.

(7) Consideration of effect of Governmental rules and regulations.

(8) Building should be so constructed as to permit possible economical expansion so as to serve the growing membership of A.F.S. and offer more comprehensive technical services to the industry.

Few voiced a question omitted from this list—will the program succeed? This has already been answered in part, for as this issue of American Foundryman goes to press, $85,000 has been contributed to the Project. Thus it may be considered a certainty that by May 1, the Project's first phase—procurement of essential funds—will have been more than achieved. There will remain the still-greater responsibilities of the Board of Directors and Committee to the Society's membership of properly and faithfully administering the trust you, the members, have placed in them to carry out succeeding phases.

To those who have taken time to offer recommendation, the Committee is grateful. Their interest and concern for the complete success of the A.F.S. Housing Project is inspiring to us who have been entrusted with its promotion. The opinions and advice offered will be vastly helpful in completing the work.

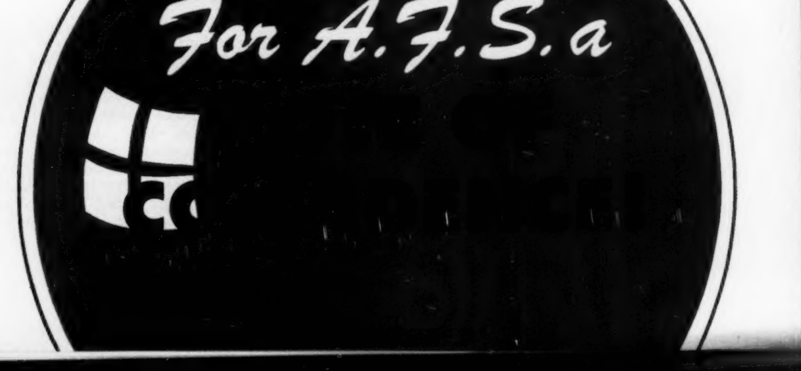
R J Teetor

Ralph J. Teetor
Chairman
A.F.S. Housing Committee

Ralph J. Teetor, president, Cadillac Malleable Iron Co., Cadillac, Mich., is a Past National President of the American Foundrymen's Society (1944-45) and National Director (1933-35). A member of a foundry family, Mr. Teetor received his degree in mechanical engineering from Purdue University in 1905, and following graduation joined the Link-Belt Co., Indianapolis, eventually becoming chief engineer there. In 1915, he resigned his position to become secretary of the Standard Malleable Iron Co., Muskegon, Mich., leaving that organization to serve as a Major in World War I. After the war Mr. Teetor became vice-president and general manager of the Howe Chain Co., Muskegon, remaining there until 1921, when he became interested in the iron and lumber business, in Cadillac, Mich. His interests in that community led him to establish the Cadillac Malleable Iron Co. Mr. Teetor has for many years been active in the A.F.S. Malleable Division and in the chapter and national affairs of the Society.

WITH THE A.F.S. BUILDING FUND now over $80,000 on February 26 and expected to top $90,000 by March 15, the original goal of $100,000 now seems certain of accomplishment by May 1. As a result, the Board of Directors of the Society hopes to discontinue membership-wide solicitation of this project immediately following the A.F.S. Annual Convention in Buffalo, April 23-26.

The Society's Directors now ask all members who have not contributed to the program, but intend to do so, to send their pledges immediately and help make this project the most successful ever undertaken by the Society. There is no doubt that hundreds of members and their companies have wished to be connected with the program to acquire a Permanent Headquarters Building for A.F.S., realizing that through a conservation of Society resources, a greater flow of technical and practical data will be made possible.



PUT THE A. F. S. OVER THE TOP!

Many undoubtedly have waited to see the progress of the program, and its success to date should leave no doubt that now is the time to indicate participation.

The Society is less concerned from now on with the amount of any individual contribution, but it feels that the splendid response to date deserves some manner of support from *every member of the American Foundrymen's Society.* As originally announced, and it is still true, this is *"A project of the entire A.F.S. membership"*.

Please determine immediately the contribution you can make to the Building Fund and notify the National Office in Chicago at once. Every contributor will be classed as a "Charter Subscriber" and will receive, when his contribution or pledge is paid in full, an attractive certificate indicating that he has played a definite part in acquiring the Permanent Headquarters Building.

The A.F.S. Housing Committee, headed by Past President Ralph J. Teetor, has volunteered its services in bringing the Fund up to its present high level. This Committee, whose personnel was announced in the December issue of AMERICAN FOUNDRYMAN, will continue to function after the solicitation is closed, and will determine such questions as when the building will be acquired, whether it will be a new building or a remodeled structure and where the future national headquarters will be located.

The Society fully expects that this project, before solicitation ends May 1, will be supported financially by 100% of the A.F.S. Board of Directors, 100% of the Society's regular Chapters, and 100% of the A.F.S. Alumni group. It is anticipated that the individual members of the Society will wish to reinforce such a vote of confidence with their own support, regardless of the size of any personal contribution. An up-to-date list of contributors to the A.F.S. Building Fund as of February 23 follows:

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(Continued on Page 26)

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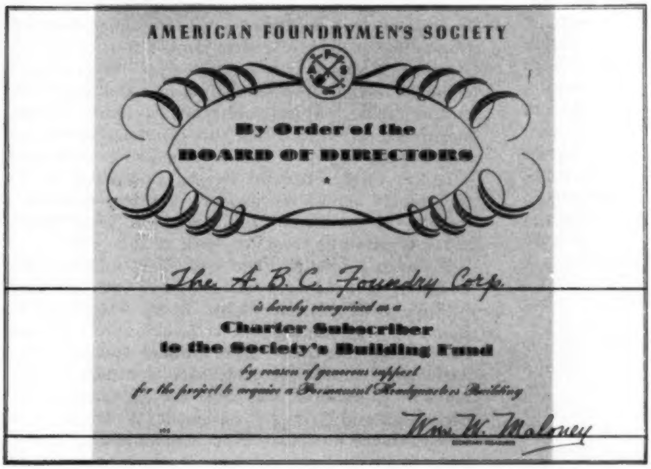

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A.F.S. Malleable Research Committee Plans New Experiments At Wisconsin

PROGRAM for the A.F.S. Malleable Division's new research project at the University of Wisconsin was formulated at a meeting of the Division's Research Committee at the University, January 5.

Investigations to be undertaken by University staff members include (1) final analysis of metal, as cast, (2) mottling tests, (3) spiral fluidity test, (4) tensile test bar, machined, (5) hot tear test, and (6) annealability test, determining degree of anneal by micro examination.

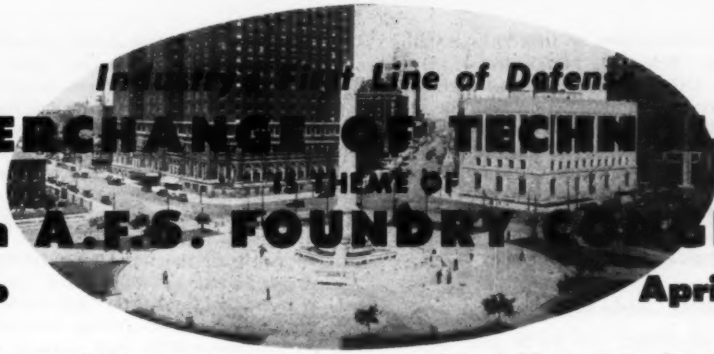
It was further decided by the Committee that a preliminary report be made by the University at a meeting of the Committee during the 55th Annual A.F.S. Convention, Buffalo, April 23-26.

Research Committee and University staff members attending were: Chairman C. F. Joseph, Central Foundry Div., GMC; H. Bornstein, Deere & Co.; W. A. Kennedy, Grinnell Co.; C. F. Lauenstein, Link-Belt Co.; W. D. McMillan, International Harvester Co.; Richard Schneidewind, University of Michigan; Milton Tilley, National Malleable & Steel Castings Co.; Cleveland; and George J. Barker, R. W. Heine, E. A. Lange, David J. Mack, Philip Rosenthal and Kurt F. Wendt, all of the University of Wisconsin. Others attending were A.F.S. Technical Director S. C. Massari; R. P. Schauss, Illinois Clay Products Co., vice-chairman, Malleable Division; and F. T. McGuire, Deere & Co., meeting guest.

Committee Meets To Plan Plaster Mold Casting Convention Symposium

PROGRAM for a Plaster Mold Casting Symposium to be held during the International Foundry Congress, Atlantic City, N. J., May 1-7, 1952, has been planned at a meeting of the A.F.S. Plaster Mold Casting Committee at A.F.S. Headquarters, Chicago, January 30.

As planned, program sequence will be (1) Introduction, (2) Review of Literature, (3) Plaster Formulations and Their Application, (4) Design Limitations of the Process, (5) Matchplate Production, (6) Production of Rubber Molds, (7) Selection and Properties of Suitable Aluminum, Brass and Bronze and Magnesium Alloys, and (8) Bibliography.



Industry's First Line of Defense

INTERCHANGE OF TECHNOLOGY

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55th A.F.S. FOUNDRY CONGRESS

Buffalo April 23-26

FREE EXCHANGE OF TECHNICAL KNOWLEDGE, a potent weapon for an industry launching an extensive national defense program, will be the theme of the 55th Foundry Congress of the American Foundrymen's Society, to be held in Buffalo, April 23-26. Newest techniques in all phases of the casting of metals will be described in papers presented by the nation's foremost foundry authorities.

The Society's 1951 Convention will be closely scheduled so as to enable busy foundrymen to absorb the greatest possible amount of technical information relating to their particular branch of the castings industry in the shortest possible time. Four days of technical sessions, round table discussions and shop courses are arranged so as to avoid conflict of interests wherever possible. Non-ferrous and malleable iron sessions will be held at the beginning of the Convention week, general interest sessions in the middle of the week and gray iron and steel sessions at week's end. Under this scheduling system, foundrymen with limited time will be able to attend those sessions in which they are particularly interested within a three-day period.

In addition to the four days of technical sessions, the 1951 Convention program will feature such annual Convention highlights as the A.F.S. Annual Meeting, Charles Edgar Hoyt Annual Lecture, Annual Banquet, Aluminum & Magnesium Round Table Luncheon, Brass & Bronze Round Table Luncheon, Malleable Round Table Luncheon, Pattern Round Table Luncheon, Gray Iron Round Table Luncheon, Steel Round Table Luncheon, Educational Dinner, Canadian Dinner, A.F.S. Alumni Dinner (by invitation only), visitations to Buffalo area foundries and allied industrial plants, a concurrent program of Ladies' Entertainment, and the popular Gray Iron, Sand, and Brass & Bronze Shop Courses, which are held evenings and open to all foundrymen of the Buffalo area free of charge.

Feature Gating and Risering Symposium

Featured event of the 1951 Convention technical program this year will be a *Symposium on Gating and Risering*, to be held the morning and afternoon of Tuesday, April 24. Aluminum & Magnesium, Brass & Bronze, Gray Iron, Malleable, and Steel Divisions of the Society will jointly sponsor this outstanding discussion by the nation's experts on a timely subject.

Morning session will start at 9:00 and will deal with theoretical aspects of gating and risering. R. F. Thomson, General Motors Corp., Detroit, will preside, introduce authors of papers to be presented, and outline purposes of the Symposium. Following this, L. W. Eastwood, Battelle Memorial Institute, Columbus, Ohio, will report progress of A.F.S. gating and risering research at Battelle, and a representative of Naval Research Laboratory, Washington, D. C., will give a resume of fluid flow work done there. Next, Arthur K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, will discuss *"Considerations in the Feeding of Castings."* Concluding paper of the morning session of the Symposium will be presented by Howard F. Taylor of the Massachusetts Institute of Technology. Each morning session speaker will be limited to 25 minutes, with 10 minutes allowed for discussion of each paper presented.

Afternoon sessions will be in charge of Divisional chairmen and will consist of successive half hour discussions of gating and risering as applied to each Division—Aluminum & Magnesium, Gray Iron, Brass & Bronze, Malleable, and Steel.

Hoyt Lecture on Industrial Research

James C. Zeder, director of engineering and research, Chrysler Corp., Detroit, will deliver the Charles Edgar Hoyt Annual Lecture, featured technical address of the 1951 Convention, the afternoon of Wednesday, April 25, following the Annual Business Meeting of the Society. Mr. Zeder will discuss *"The Management of Industrial Research."*

This year, for the first time, Metallografiska Insitutet (Swedish Institute for Metal Research) will provide a Convention Exchange Paper—*"An In-*

vestigation of the Penetration of Steel Into Molding Sand," by Holger Petterson, Metallografiska Institutet, Stockholm. Other Exchange Papers, highlights of the Convention technical program, will be that of the Institute of British Foundrymen—*"Basic Cupola Melting and Its Possibilities,"* by E. S. Renshaw, head foundry metallurgist, Ford Motor Co., Ltd., Dagenham, England—and the Institute of Australian Foundrymen's Exchange Paper, *"The Modification Technique of Aluminum-Silicon Alloys,"* by R. Dyke, Defense Research Laboratories, Marybirnong, Victoria.

Sessions Closely Scheduled

As previously mentioned, the A.F.S. Aluminum & Magnesium, Brass & Bronze and Malleable Divisions are scheduled to begin Monday morning, April 23, and Educational Division sessions that afternoon, while Convention general interest sessions are scheduled for Monday, Tuesday and Wednesday, April 23 through 25. Pattern Division and Sand Divisions' sessions are scheduled for Tuesday and Wednesday, April 24 and 25, and Gray Iron and Steel Divisions for Tuesday, Wednesday and Thursday, April 24 through 26. Brass & Bronze Sand Course will be held the evenings of April 23 and 24, and the Gray Iron and Sand Shop Courses the evenings of April 23, 24 and 25.

Aluminum & Magnesium Division will open its two-day technical program with a morning technical session, the Aluminum & Magnesium Round Table Luncheon, and a late afternoon technical session on Monday, April 23. The Division's program on Tuesday, April 24, will include participation in the *Symposium on Gating and Risering* in the morning and afternoon and a technical session that afternoon.

Brass & Bronze Division's technical program will open Monday morning, April 23 with a technical session, followed by the Brass & Bronze Round Table Luncheon and a late afternoon technical session. In the evening, the first of two Brass & Bronze Sand Courses will be held. On Tuesday, the Division will participate from 9:00 a.m. to 12:00 noon and from 2:00 p.m. to 4:00 p.m. in the *Symposium on Gating and Risering.* Concluding the Division's technical program will be the second and final Brass & Bronze Sand Course at 8:00 p.m.

Malleable Division will open its two-day technical program with sessions at 10:00 a.m., 2:00 p.m. and 4:00 p.m. on Monday, April 23. On Tuesday, April 24, the Division will participate in the first half of the *Symposium on Gating and Risering* in the morning, followed by the Malleable Round Table Luncheon, and will conclude its two-day program with the afternoon session of the gating and risering symposium.

Educational Division will begin its program with a technical session the afternoon of April 23, followed by the annual Educational Dinner at 6:30 p.m. that evening. The morning technical session will be divided into two topics: (1) Industry—*"Apprentice Training,"* and (2) Education—*"Trade School."* Again at the Educational Dinner, two talks will be featured: (1) Industry—*"Absorbing the Technical Trainee,"* and (2) Education—*"Developing Students for Industry."*

Scheduled for the Gray Iron Division on Monday, April 23, the first of three Gray Iron Shop Courses, will be devoted to *"Air in the Cupola."* Held in the evening, these courses are open to all local foundrymen as well as Convention attendants without charge. The Division's program will get into full swing with participation in the *Symposium on Gating and Risering* the morning and afternoon of Tuesday, April 24. Concluding the program for the day will be a Gray Iron Shop Course session on *"Melting Iron in a Reverberatory Type Furnace."*

On April 25 the Gray Iron Division has scheduled a technical session at 10:00 a.m. and the final Gray Iron Shop Course, on *"Metal Pouring Temperature Control,"* in the evening. Concluding the Division's program will be one morning and two afternoon technical sessions and the Gray Iron Round Table Luncheon.

Sand Division will launch its Convention program with the first of three Sand Shop Courses, open to all foundrymen, Monday evening, April 23. First Sand Division technical session will be held at 4:00 p.m., Tuesday, April 24, following the *Symposium on Gating and Risering.* At 8:00 p.m. the second Shop Course will be held. Final day's program will consist of technical sessions Wednesday morning and afternoon, April 25, and the last Sand Shop Course in the evening.

One of the many outstanding civic attractions to be

Steel Division's program will begin with participation in the *Symposium on Gating and Risering* the morning and afternoon of Tuesday, April 24. Next event on its schedule will be a technical session the morning of Thursday, April 26, followed by the Steel Round Table Luncheon and two more technical sessions in the afternoon, concluding its program.

Pattern Division will launch its Convention technical program with a session at 4:00 p.m., Tuesday, April 24. Second and final Divisional event will be the Pattern Round Table Luncheon, April 25.

Meetings of general foundry interest will begin with morning and afternoon sessions on Heat Transfer on Monday, April 23. On Tuesday, April 24, the Timestudy & Methods Committee will hold a session at 4:00 p.m.; the A.F.S. Foundry Cost Committee a session at 10:00 a.m., April 25, the Plant & Plant Equipment Committee afternoon and evening sessions

on April 25, and the A.F.S. Refractories Committee a session at 4:00 p.m., Wednesday, April 25.

Preprints of Convention technical papers will be mailed the last week in March. All A.F.S. members desiring preprints are urged to return the preprint request forms, which they have already received, at the earliest possible date.

Written discussion to Convention technical preprints should be made in quadruplicate, and three copies mailed to S. C. Massari, Technical Director, American Foundrymen's Society, 616 South Michigan Ave., Chicago 5, Ill. The discussor is to retain the fourth copy for his files.

The Annual Business Meeting of the American Foundrymen's Society is scheduled for 2:00 p.m., Wednesday, April 25. Meeting highlights will be the President's Annual Address, given by Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, and A.F.S. Secretary-Treasurer Wm. W.

found in Buffalo is the noted Albright Art Gallery.

Maloney's annual report on the "State of the Society." Following this, President Woody will present cash awards and certificates to winners of the 1951 A.F.S. National Apprentice Contest, which will be judged March 31 at the New York State Institute of Applied Sciences in Buffalo.

Other scheduled Convention highlights will include the annual Canadian Dinner, to which all Canadian members of the Society are invited, at 7:00 p.m., Tuesday, April 24; the A.F.S. Alumni Dinner (by invitation only) the evening of April 25; and, climaxing the Convention, the year's top foundry social event, the Annual Banquet of the American Foundrymen's Society. To be held the evening of April 26 and open to all convention attendants and their ladies, the Annual Banquet will be addressed by a nationally-prominent speaker, to be announced at a later date, and will feature presentation of A.F.S. Gold Medals and Honorary Life Memberships in the Society to men of outstanding achievement in the foundry industry.

Register in Advance and "Walk Right In"

Because of exceptionally heavy Convention attendance anticipated on the basis of hotel registrations, A.F.S. is this year instituting a new "Wear Your Badge and Walk Right In" policy of advance registration. Designed to prevent registration desk "traffic jams," Advance Registration forms will be mailed all members early this month.

Members desiring to take advantage of this new plan are requested to fill in the form and mail it, together with a remittance of $2 to cover the member registration fee, so as to reach A.F.S. Headquarters, 616 South Michigan Ave., Chicago 5, Ill., on or before April 10. Official member Convention badges will then be mailed the applicant, exempting him from registering at the Convention.

Expect Heavy Convention Attendance

Buffalo Convention Bureau announces that the large number of Convention Housing Applications received to date presages a heavy attendance. Acknowledgments of applications received to date are being mailed as rapidly as processing permits. Members who have not as yet submitted applications for hotel accommodations are urged to forward them at once to H. Ward Stewart, Jr., manager, Housing Bureau, 1951 A.F.S. Congress, 602 Genessee Bldg., Buffalo, 2.

Publication of A.F.S. "*Engineering Properties of Cast Iron*" Announced

Conceived and prepared by the A.F.S. Gray Iron Division's Committee on Symposium of Engineering Properties of Cast Iron, a newly-published, 93-page, 6 x 9 in., illustrated work, Engineering Properties of Cast Iron, provides concise, authoritative information on properties and applications of gray iron in the castings industry.

Originally presented as a technical paper at the 1946 A.F.S. Convention in Cleveland by W. E. Mahin of Armour Research Foundation and H. W. Lownie of Battelle Memorial Institute, the information in this book has been carefully reviewed by some of the nation's foremost metallurgists, who have made it available in a form readily accessible and of practical use to the design engineer.

Contents include chapters on chemical and physical nature of cast iron, a review of important properties of cast iron, designing and specifying gray iron castings, specific applications of cast irons, and cast iron properties and preferred practices. Data are given where possible in graphic or tabular form.

Copies of Engineering Properties of Cast Iron are available from American Foundrymen's Society, 616 S. Michigan Ave., Chicago, at $2.25 to A.F.S. members and $3.50 to non-members.

Chapter Aids Student Interviewing

Interviewing of June graduates of the Missouri School of Mines and Metallurgy has been given a material assist by the St. Louis District Chapter's Educational Committee, which recently notified all chapter members that some 200 graduates will be available for job interviews on March 7, 8, 9, 12, 13, 21, 22 and 23. Foundries wishing to avail themselves of these engineering school graduates are requested to contact Assistant Dean R. Z. Williams, Missouri School of Mines and Metallurgy, Rolla, Mo.

METAL PENETRATION TEST

S. L. Gertsman*
and
A. E. Murton*

The metal penetration test described in this paper has been approved by the Executive Committee of the A.F.S. Sand Division as a tentative standard test procedure. Messrs. Gertsman and Murton will present a paper at the 1951 A.F.S. Convention in Buffalo, N. Y., April 23-26, describing further work done using this test procedure.

A SIMPLE TEST has been devised for metal penetration in sand cores. This is based on the principle that ferro-static pressure is a major cause of penetration. A description of the test casting and the procedure used is given in the following.

Figure 1 illustrates the casting and core arrangement. A cored sprue, runner and ingate 1¼ in. in diameter (I.D.), fed the metal into the bottom of the mold cavity. The four test cores each 1⅛ in. in diameter by 2 in. high, double-end rammed, were pasted into a core which had four core prints each ½ in. deep.

The cores projected into the casting 1½ in. (Fig. 2). These four cores were equally spaced around the ingate. The centerlines of the cores were on a radius 1½ in. from the center of the ingate. Figure 3 shows an assembly of all the cores.

The casting is 5⅞ in. across the bottom face and 6 in. across the top. The height is varied according to the ferrostatic pressure required. A circular cone core was always placed in the center of the top face to allow for atmospheric pressure feeding. A 4 in. high "whistler" was used at one edge of the top face. The sprue height was also held to a height of 4 in. above the top face of the casting.

Figure 4 illustrates the arrangement used. The bottom flask is the drag and shows the four test cores pasted into the bottom core. The center flask shows the cope and illustrates the cone shaped atmospheric pressure core. The top flask is the cheek.

In this casting tests may be carried out simultaneously on four cores of different sand mixtures. The severity of the test can be controlled by varying the height of the casting. The relative resistance of the test cores can be determined by comparing the degree of penetration in them. The method of measuring the penetration may be varied to suit the individual laboratories. Suggested methods of measurement are:

1. Visual examination: the depth of penetration can be estimated. This method should prove satisfactory in most cases.
2. Macroscopic examination: the core holes are cut and the penetration measured.
3. Microscopic examination: the core holes are cut

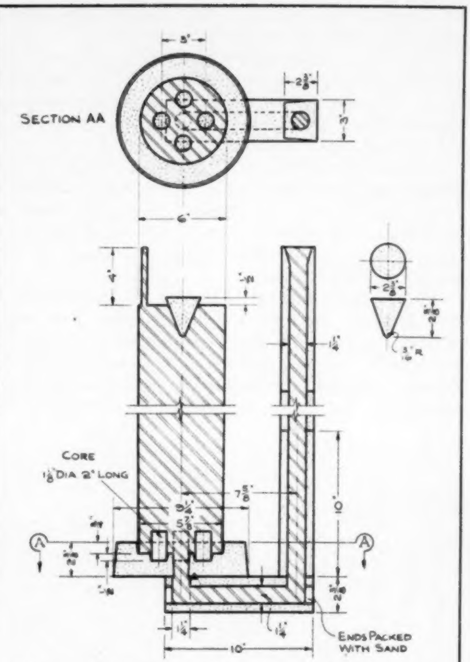


Fig. 1—Metal penetration test casting diagram.

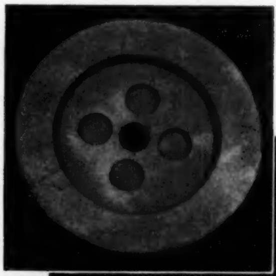


Fig. 2 (left)—Bottom core has four ½ in. core prints.

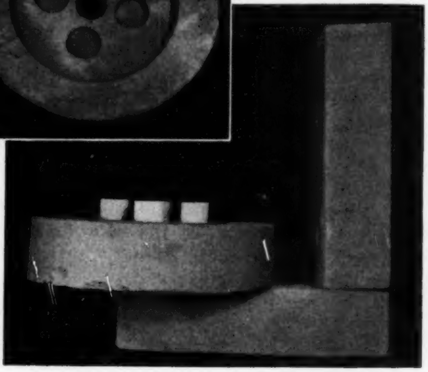


Fig. 3 (below)—Assembly of all cores.

NOTE: This paper is published by permission of the Director-General of Scientific Services, Dept. of Mines and Technical Surveys, Ottawa, Ont., Canada.

*Chairman, Mold Surface Committee, A.F.S. Sand Div., and metallurgist, Physical Metallurgy Div., Mines Branch, Ottawa, Ont., Canada, respectively.

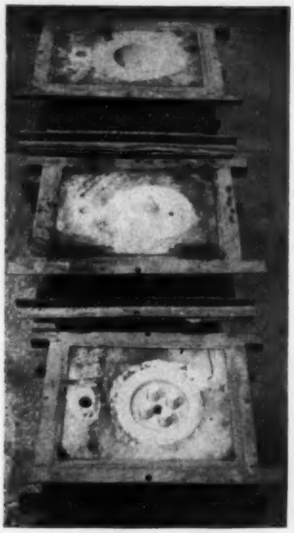


Fig. 4—Mold assembly for the test casting—bottom, drag with four test cores pasted into bottom core; cope with cone shaped atmospheric pressure core; top, cheek section.

and sections mounted. The penetration is measured under a microscope at low power. The average of about 20 readings of peaks and valleys at the metal-sand interface is taken. This method is preferred when the depth of penetration is slight.

The penetration test casting may also be used as a means of evaluating core washes to determine their effectiveness in preventing penetration caused by metallostatic pressure. A specified sand mixture should be used for this test. It has been found that, with most commonly used sand mixtures and core washes, moderate casting heights (5-24 in.) should be employed.

The 1⅛-in. diameter 2-in. high core was adopted for this test because the equipment for making it by controlled double-end ramming was already in existence. The standard 2-in. diameter A.F.S. core has the disadvantage of being single-end rammed. If the standard core were to be used in the penetration test casting care would have to be taken to keep the same end up in all cases. However, laboratories which do not possess the equipment for preparing the 1⅛-in. diameter cores may prefer to use the standard 2-in. core in spite of its disadvantages. Use of a larger diameter casting with larger cores should provide useful test results.

The use of this test casting has been demonstrated in a paper* presented by the authors at the 1950 A.F.S. Convention in Cleveland. This test for metal penetration was proposed as a tentative standard by the A.F.S. Mold Surface Committee. Further work on penetration is being carried out by the committee, using this test casting.

*S. L. Gertsman and A. E. Murton, "An Investigation of Metal Penetration in Steel Sand Cores," A.F.S. TRANSACTIONS, vol. 58, pp. 593-603 (1950).

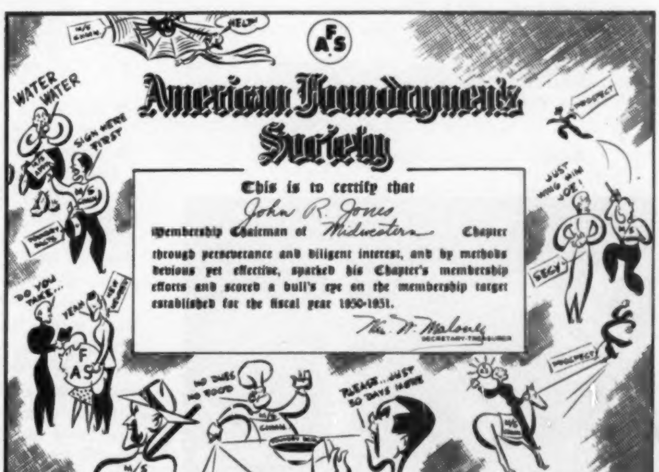
A.F.S. Committee 8-J Holds 3-Day Meet To Study Cored Surface Veins

CAUSES OF VEINING on cored surfaces were the subject of a three-day operating meeting of the A.F.S. Committee 8-J, Physical Properties of Iron Molding Materials at Elevated Temperatures, held concurrently at the University of Michigan Foundry and in the laboratories of the Harry W. Dietert Co., Detroit.

Half the Committee worked in the University Foundry and the other half in the Dietert Laboratories in two-shift groups. The foundry group made a total of 560 cores, part of which were used to make test castings, with the remainder used in the laboratory for tests. As a result of the three-day meeting, test castings and laboratory data were obtained showing how veining is affected by various factors.

Certificate Lauds Work Of Chapter Membership Chairmen

This amusing certificate will be presented to those chapter Membership Chairmen who achieve chapter membership "targets" established last fall with the object of bringing the Society's membership to a total of 10,000 by June 30, 1951. The 10,000-member goal will bring A.F.S. back to its all-time high of 10,063 members (June 30, 1949). It is expected that increasing need for free interchange of technical information to meet defense casting requirements will result in A.F.S. passing its previous top figure by the end of 1952. A number of chapters have already reached their targets, due to energetic work by their Membership Chairmen. Awards will be announced at the Eighth Annual Chapter Officers Conference, in Chicago, June 25-26.



MANUFACTURE OF BRONZE BOILER DROP PLUGS

B. F. Kline
Chief Chemist
and
J. R. Davidson
Supervisor of Foundry Operations
Southern Pacific Railroad Co.
Sacramento, Calif.

Vitally important to the safe operation of steam locomotives, boiler drop plugs serve as a warning of low water which might be the cause of a boiler explosion. When boiler water becomes low, these plugs must be capable of functioning under differential stresses of unknown magnitude and must withstand temperatures as high as 420 F at 300 psi on the water side, and firebox gases up to 2800 F on the firebox side. A further complication which adds to the severity of service is the corrosive attack of firebox gases on one end of the plug, and the attack of hot alkaline boiler water on the other. Thus, boiler drop plugs, because of the severe service to which they are subjected, require the best materials and workmanship. This article describes the various phases of their manufacture and testing and investigations of varying fusible alloy compositions under simulated service conditions.

The main part of a drop plug consists of a bronze casting (Fig. 1), in which is inserted a rolled bronze button held in place with a 0.003-in. thick film of fusible metal (Fig. 2). This fusible alloy has a softening point of about 540 F. The plugs are screwed from the firebox side into and through the crown sheet in the top of the firebox until they project not less than 1-¼ in. above the crown sheet on the water side of the firebox.

Preprint No. 51-57. This paper will be presented at a Brass & Bronze Session of the 55th Annual Meeting, American Foundrymen's Society, at Buffalo, April 23-26, 1951.

Fig. 1—Bronze castings used in boiler drop plugs.

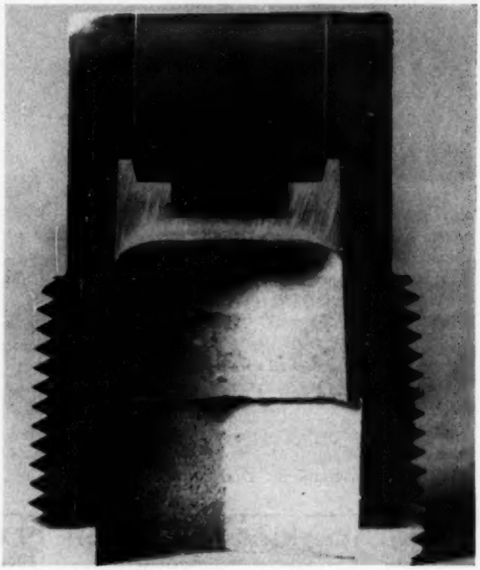


Fig. 2—Cross-section of boiler drop plug. Rolled bronze button is held in place in casting by means of a 0.003-in. film of metal that softens at 540 F.

Functioning principle depends upon the film of bonding metal becoming fused, permitting the button to be blown by high boiler pressure into the firebox. All Southern Pacific steam locomotives have from three to seven of these drop plugs screwed into the crown sheet.

Usually, the plug on the highest part of the crown sheet is the first to let go. Discharge of steam into the firebox serves as a warning to the locomotive crew that something is wrong and that immediate action must be taken to cut the fire off.

Good castings are analogous to good cooking in that good ingredients are a primary requisite. Metals should be clean, dry and free from grease and oil. In making drop plug bodies no scrap returns are

used—only new metals—with the exception of copper, since it has been found that heavy scrap trolley copper performs better than new ingot copper in that the film of oxide on the trolley metal counteracts a tendency to absorb oxygen.

All metals are accurately weighed so as to furnish a composition conforming to the following analysis: copper, 86-88 per cent; tin, 6-7; lead, 1-2; zinc, 3-4; nickel, 1.0 max; iron, 0.25 max; phosphorus, 0.05 max. This analysis conforms to ASTM B143 for leaded tin bronze.

Melting is accomplished in a horizontal tilting furnace, using a combination fuel of oil and gas. Originally, fuel oil was used for melting, but later a combination burner was adopted, using low-pressure natural gas of around 950 BTU at 5 psi. Gas and oil valves are regulated to furnish approximately a 50-50 mixture in which the gas vaporizes the fuel oil for more efficient combustion.

Combustion is regulated so as to keep it slightly

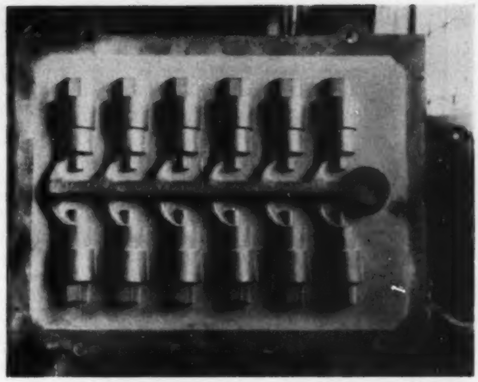
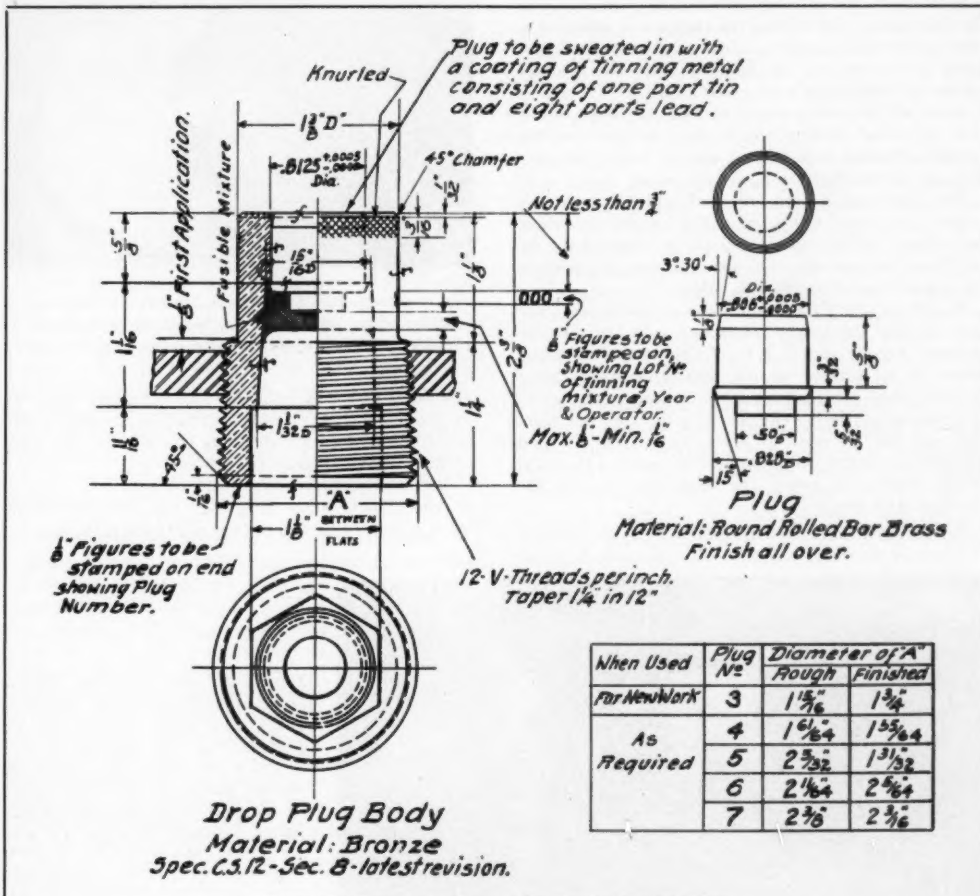


Fig. 3—Cope side of aluminum matchplate used in casting bronze boiler plugs. Drag side is identical.



When Used	Plug No.	Diameter of "A" Rough	Diameter of "A" Finished
For New Work	3	1 15/16"	1 3/4"
As Required	4	1 61/64"	1 35/64"
	5	2 5/32"	1 31/32"
	6	2 11/64"	2 5/64"
	7	2 3/8"	2 3/16"

Detailed diagram of $^{13}/_{16}$-in. diameter boiler drop plug.

Fig. 4—Boiler plug cores are carefully baked to avoid pinhole porosity in the bore of the casting.

on the oxidizing side, but as an added safety measure the melt is oxidized with sodium nitrate and then deoxidized with phosphorus copper, which reduces porosity from hydrogen absorption. The furnace is brought up to 2200 F and its contents poured into preheated ladles.

Molding is accomplished on molding machines of the jolt-squeeze type, using matchplates of aluminum. Natural bonded molding sand is used. All pop-off flasks and jackets are of aluminum and all cores are produced with California white sand.

Since no pinhole porosity can be tolerated in the bore of these bodies, which receives the buttons, careful attention is paid to thorough baking of cores (Fig. 4), before they are placed in molds.

The body and button are machined in progressive stages on turret lathes specially tooled for these operations. After machine work is completed, the body and button move to the finishing department for application of the fusible alloy.

Before applying the fusible metal, bodies and buttons are first cleaned by immersion in a hot alkaline cleaner (Fig. 5) at 180 F for 15 min, to remove any grease or oil present on the finished surfaces. After removal they are rinsed in hot water, immersed in hot, strong muriatic acid for 10 min, removed from the acid and allowed to drain. It has been found advisable to follow this procedure to insure a chemical bond. From this point, the body and buttons are handled with tongs.

The bodies are next preheated in two electric ovens thermostatically controlled at 650 F. with a circulating fan in each oven. Dry nitrogen gas is piped to each oven and is fed at a rate of approximately 2-3 liters per min, controlled by a flow meter to prevent oxidation at high temperature. Bodies are fed into the oven and removed so as to obtain a heating cycle of approximately 10 min. After removal from the oven they are dipped into a special flux, consisting of zinc chloride, ammonium chloride and water acidified with muriatic acid. Next, they are immersed in the fusible alloy, which consists of 11.10 per cent tin and 88.90 per cent lead, or roughly 1 part tin to 8 parts lead.

The fusible alloy is melted and kept molten in a circular cast iron pot heated electrically and maintained at 650 F-675 F by thermostatic control. The pot holds 95-100 lb of metal and is heavily insulated on the outside to conserve heat and insure the operator's comfort. Heating elements are cast into the walls of the pot and operate on 220 volts a-c.

Fig. 6—Body and button are tinned by dipping in fusible alloy. Alloy is poured into 1-in.-diameter stainless ladle to depth of 1/8 in. over button.

Both the body and the button are tinned by dipping in the fusible alloy (Fig. 6). The film of fusible alloy surrounding the button is obtained by pouring

Fig. 5—Before applying fusible metal that holds them together, boiler plug bodies and buttons are immersed in hot alkaline cleaner at 180 F for 15 minutes to remove surface grease or oil, then rinsed in hot water and immersed in hot, strong muriatic acid for 10 min.

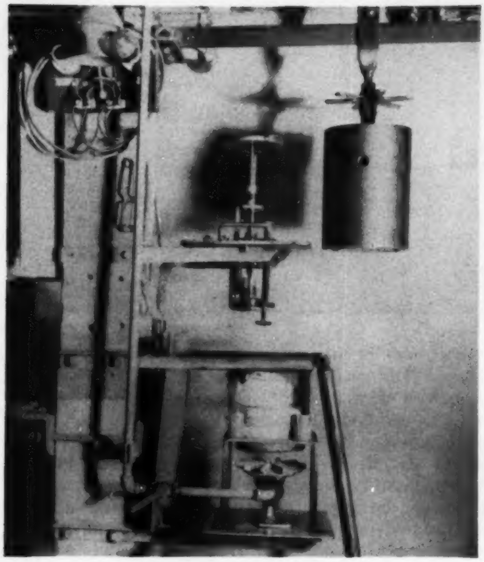


Fig. 7—Apparatus used in testing boiler drop plugs.

a predetermined volume of molten alloy to a depth of 1/8 in. over the top of the button. A small, stainless steel pouring ladle, slightly more than 1 in. in diameter, is used for this purpose. The fusible metal is cleaned of mechanically trapped impurities by bubbling dry nitrogen gas through it for 8 to 10 min at the end of every hour.

The whole assembly is then carefully transferred to a cooling plate to solidify. This cooling plate consists of a hot plate held at 140 F by thermostatic control. It has been found that slow, controlled cooling will prevent hairline cracks in the fusible alloy. After the metal has solidified and the plugs are reasonably cool, they are given a final wash and buff. Six out of every 125 are picked at random and sent to the laboratory for testing.

Examined For Dropping Temperature, Bond

When finished drop plugs are received in the laboratory, they are divided equally for different examinations. One-half of the plugs are tested for dropping temperature. This is done by placing the plug to be tested in a supporting saddle immersed in an agitated oil bath preheated to a temperature of 515 (Fig. 7). A weight is applied on the button of the drop plug so that the load over the button face equals 300 psi.

Temperature of the oil bath is raised slowly until the plug functions. Function should occur under such conditions at a temperature of 530 F to 555 F. After functioning of the plug, the oil bath is cooled to 515 F, at which point another plug is inserted and the cycle repeated. This cooling period between the testing of the plugs is essential. Temperature at time of plug functioning is measured with a mercury thermometer.

The other half of the test lot of plugs is examined for bond as follows: a plug is split by first sawing a 1/2-in. V in opposite sides of the threaded end. Then, without sawing through the button, the rest of the plug body is sawed in line with the apex of the V. The threaded end is then placed in a vise and pressure is applied until the plug body separates from the button, exposing the alloy bond area.

If the bond of any plug shows other than a uniformly frosty appearance over the face of the split bond, or if in the dropping test any plug functions outside the temperature limits 530 F to 555 F, that plug is considered to have failed. In that event, six more plugs of the same serial and operator number are obtained and either split or dropped. If any of these six should fail, that operator's lot of 82-84 plugs is reworked and resubmitted for testing. If such plugs fail to pass a second time, the lot is scrapped and a new set of plugs processed from new bodies and buttons.

Reduce Button Creep Tendency

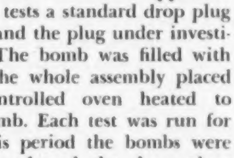
In order to reduce tendency of buttons to creep at such boiler pressures as 300 psi, research work has been conducted on such phases of their manufacture as: (1) various fusible alloys, such as silver solder, reduced tin content and pure lead; (2) nickel plating part exposed to boiler water; (3) heat treatment and aging; and (4) design change.

Preliminary tests were run in the laboratory using four small steel bombs with each end tapped to receive a drop plug. On all tests a standard drop plug was screwed in at one end and the plug under investigation at the other end. The bomb was filled with typical boiler water and the whole assembly placed in a thermostatically controlled oven heated to produce 300 psi in the bomb. Each test was run for 168 hr. At the end of this period the bombs were taken from the oven to cool and the drop plugs removed for examination.

These tests indicated that silver solder has a tendency to corrode, while nickel plate rapidly ruptures. Lowering tin content causes difficulty in processing. The final outcome of these tests was to adopt a change in design whereby length and diameter of the button were increased 1/8 in. This increased the effective bonding area, but maintained the standard fusible alloy composition of 88.90 lead and 11.10 tin.

To confirm laboratory findings, road tests were run on locomotives equipped with the longer buttons and it was found this design change materially reduced tendency of the button to creep. The change was then adopted as standard.

New, Smaller A.F.S. Pins Available



Contrasted here in actual sizes are the old A.F.A. pin and the new, smaller A.F.S. pin, reduced in size by popular demand of members of the Society. The new 3/8 in. diameter pins will be traded for the old A.F.A. pins at no extra cost or are available at $1 each from A.F.S. National Office, 616 S. Michigan, Chicago 5.

Gray Iron Metallurgy Featured at Birmingham Regional Foundry Conference

J. P. McClendon
Publicity Chairman
Birmingham District Chapter

OVER 400 SOUTHERN FOUNDRYMEN made their annual trek to Birmingham for the Birmingham District Chapter's 19th Annual Regional Foundry Conference at the Tutwiler Hotel, February 22-24. They heard papers on engineering properties of gray iron, machinability of high phosphorus gray iron, and substitution of zirconium for manganese in gray iron. Other technical sessions covered recent foundry developments and the A.F.S. color-sound research film on metal flow. A.F.S. National President Walton L. Woody, National Malleable & Steel Castings Co., Ceveland, and A.F.S. Secretary-Treasurer Wm. W. Maloney, Chicago, spoke at the conference luncheon. Banquet speaker was Ralph L. Lee, General Motors Corp., Detroit.

General conference chairman was Morris L. Hawkins, Stockham Valves & Fittings, chapter chairman; C. K. Donoho, American Cast Iron Pipe Co., vice-chairman of the chapter was in charge of the conference program.

The conference opened with National Director T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., speaking on *"Engineering Properties of Gray Iron for Foundrymen."* Presiding was R. L. Jackson, Jackson Industries. The speaker told how mechanical properties of gray iron are influenced by graphite flake size, shape, and distribution. The A.F.S.-ASTM graphite flake chart enables foundrymen, designers, and metallurgists to work together to achieve desired structures, he said.

Explaining the influence of section size on cooling rate and mechanical properties, Mr. Eagan pointed out that ASTM specification A48 refers to test bar values, not casting properties. Best practice, he declared, calls for correlation of test results on arbitration bars with those of specimens cut from critical sections of important castings.

One of the groups at the Birmingham Conference banquet attended by over 400 foundrymen and guests.

In closing, Mr. Eagan said that designers do not deliberately design castings which can't be cast. Foundrymen should beware of pride in being able to cast anything, he warned, and should carry on mutual educational programs between themselves and designers so each will understand the other.

A.F.S. exists for and should be used as a forum for discussing foundry technical problems, said National President Woody in his luncheon address, *"Asset or Liability."* The Society is an educational organization in the term's broadest aspects, he stated. He reviewed recent progress of A.F.S. and showed how foundrymen using the Society's facilities have made themselves more of an asset to their companies and their industry. Mr. Woody was introduced by Secretary-Treasurer Maloney.

The luncheon meeting was opened with greetings from Birmingham's mayor, Cooper Green. Chairman of the luncheon was C. K. Donoho.

Reviews Recent Foundry Advances

Speaking at the afternoon's first technical session, L. A. Danse, General Motors Corp., Detroit, discussed *"Foundry Developments as General Motors Sees Them."* Session chairman was Frank C. Coupland, American Cast Iron Pipe Co. Mr. Danse reviewed recent trends in castings production and equipment and said that development of foundry equipment has not kept pace with mechanical developments in other fields. Equipment manufacturers are working on the problem, he said, and predicted that mold making will be fully automatic some day.

Among foundry developments covered in Mr. Danse's talk were: plaster molding, shell molding, nodular iron, push-button sand molding, and cupola emission control.

The second motion picture based on A.F.S. research was shown at the first day's concluding techn cal meeting. Entitled *"Fluid Flow in Transparent Molds,"* the color-sound film illustrated the development of a superior gating system for castings of relatively low ratio of height to area by means of flow studies of water in transparent plastic molds. Adaptability of the method of study to actual foundry conditions was shown by casting a high-drossing alloy in sand. The

Left—Richard J. Stockham, Stockham Valves & Fittings, Birmingham, was toastmaster at the Birmingham Regional Foundry Conference banquet. Right—Discussing conference affairs are (left to right) National President Walton L. Woody, Chapter Secretary Fred K. Brown, Adams, Rowe & Norman, Inc., National Secretary-Treasurer Wm. W. Maloney, Chapter Chairman Morris L. Hawkins, Stockham Valves & Fittings, and Vice-Chairman C. K. Donoho, American Cast Iron Pipe Co.

preferred gating system produced clean, radiographically sound castings. Chairman of the fluid flow session was C. K. Donoho.

At the conference banquet the end of the first day, Ralph L. Lee addressed over 400 foundrymen on "*Man to Man on the Job.*" He called for greater understanding of the problem of working together. Men should not be dealt with on the basis of their ease of replacement but on the basis of their role in contributing to the successful conduct of plant operations, he declared.

Banquet toastmaster was Richard J. Stockham, Stockham Valves & Fittings. Chapter Chairman Morris L. Hawkins presided.

The morning of the second day and the full third day were open for plant visitations. No technical sessions were scheduled.

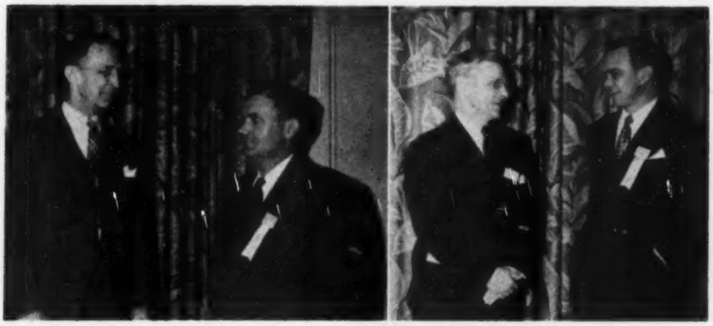
Technical sessions the afternoon of the second day dealt with studies of zirconium in cast iron. First speaker was W. W. Austin, Southern Research Institute, who told how to produce a zirconium-treated high-phosphorus iron with machinability similar to an untreated, low-phosphorus iron. The problem, he said, is to soften the matrix so steadite and pearlite have the least adverse influence on machining. M. D. Neptune, National Cast Iron Pipe Co., Birmingham, was chairman of the session.

At the following session, Warren C. Jeffery, University of Alabama, presented a paper on "*Zirconium for Manganese in Gray Cast Iron.*" Presiding was Ross W. Martin, McWane Cast Iron Pipe Co. Zirconium, the speaker said, can be substituted for manganese in cast iron on the basis of tests run on automotive gray irons. It reduces hardness and chill, refines graphite, increases the amount of ferrite, and improves machinability, he declared.

Zirconium was added, in the tests reported, as a ladle addition of Zr-Fe-Si alloy and also in the cupola. Optimum addition is about 0.2 per cent, leaving a residual of about 0.1 per cent, according to Mr. Jeffery. (Details will appear when the paper is published soon in AMERICAN FOUNDRYMAN.)

Conference Committee Workers

Birmingham District Chapter members who planned this year's regional conference are: *general chairman*, Mr. Hawkins; program—*chairman and co-chairman*, Messrs. Donoho and Neptune; plant visitations—Ray F. Frings, Harry G. Mouat Co., *chairman*, and Joe T. Gilbert, Stockham Valves & Fittings, *co-chairman;* registration—Jack E. Williams, Alabama By-Products Corp., *chairman;* Howard Nelson, Hill & Griffith Co., *co-chairman;* W. K. Bach, Foundry Service Co.; L. A. DeShazo, DeBardeleben Coal Corp.; M. L. Carl, Sloss-Sheffield Steel & Iron Co.; Morris C. Benners, T. H. Benners & Co.; Fred B. Eiseman, Woodward Iron Co.; entertainment—E. A. Brandler, Electro Metallurgical Div., Union Carbide & Carbon Corp., *chairman;* Messrs. Carl and Bach; E. M. Whelchel, American Cast Iron Pipe Co.; W. Guy Bagley, Woodward Iron Co.; greeters—Fred C. Barbour, McWane Cast Iron Pipe Co., *chairman;* Grover C. Arnwine, Alabama By-Products Corp.; Donald C. Abbott, Hill & Griffith Co.; John F. Drenning, Kerchner, Marshall & Co.; A. S. Holberg; publicity and photography—J. P. McClendon, Stockham Valves & Fittings.



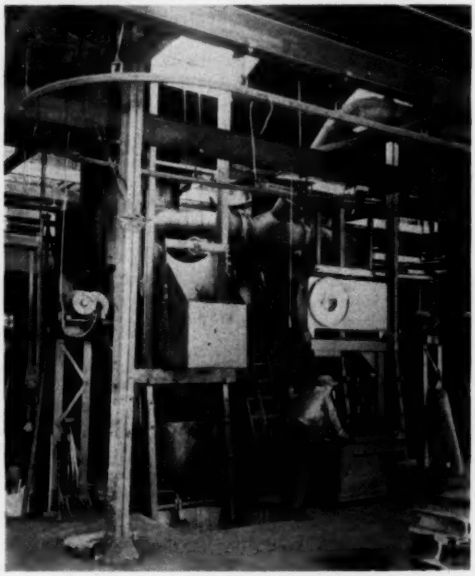
Technical speakers and session chairmen for the first day of the Birmingham Regional Foundry Conference were, left to right, L. A. Danse, General Motors Corp., Detroit, speaker, and Frank G. Coupland, American Cast Iron Pipe Co.; T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., speaker, and R. L. Jackson, Jackson Industries. All photographs by J. P. McClendon.

MODERN FOUNDRY METHODS...

MECHANIZING THE SMALLER FOUNDRY

Ways and means for partial or complete mechanization of the smaller foundry are given in the following condensed version of the talk presented by K. F. Lange, sales manager, and R. J. Geitman, foundry equipment engineer, Link-Belt Co., Chicago, at meetings of the five A.F.S. West Coast Chapters during January, 1951.

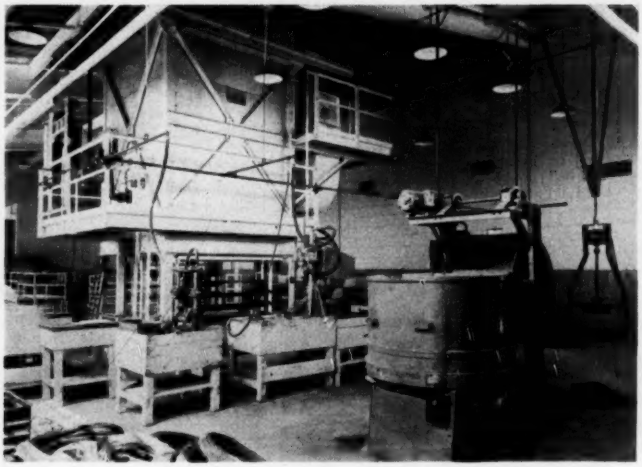
Foundries are mechanized to (1) obtain lower unit costs; (2) increase production; (3) conserve man power and building space; (4) improve working conditions.



Mechanization of materials handling operations has achieved these objectives in many foundries, both large and small. Installation of sand and mold handling systems has increased production in the same floor area as much as 50 to 200 per cent, depending upon previous conditions, such as type and volume of work, supervision, etc. Working conditions have been improved and the morale of workers has been raised.

Many shakeouts are completely mechanized. Unit costs are reduced substantially by the accumulated benefits of more production per square foot of floor space, more output per worker, improved quality through better control, lower castings losses, and often lower workmen's compensation rates.

The real problems of mechanization show up in a study of the extent to which any individual foundry can mechanize profitably, and the variables which govern such considerations. Probably no two foundries are ex-

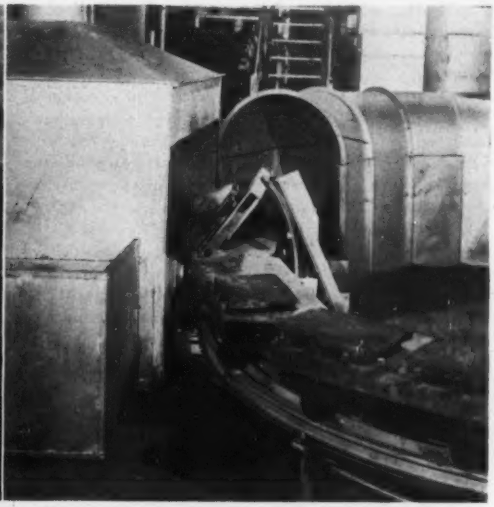


Above at left a mono-rail system fitted with scale beam and bottom dump bucket is used for transporting charge to side dump charger on cupola. Wheelbarrows and balance charging cars are also used for charging cupola for the small operation.

A core bench line is arranged with monorail carrier system for transferring the core sand to the various core bench hoppers.

A core sand muller, a vertical core oven, and core benches are shown in a neat arrangement. Proper location of core room should be carefully considered for raw material delivery and delivery of cores to foundry.

...MODERN FOUNDRY METHODS



The mold is dumped through an opening in the floor to an oscillating trough conveyor for transporting the sand and castings to a central shakeout screen. In the semi-continuous foundry, where intermittent pouring takes place, the length of the gravity roll line should be selected on the basis of production requirements.

In the continuous foundry, the power-driven mold conveyor (above, right) can be effectively employed where the melting rate is in excess of 3 tons per hour. The shakeout zone on a mold conveyor line, handling snap flask molds, is shown with the dumping device in operation.

A gravity roll conveyor system is arranged with a transfer car for transporting the mold, after pouring and cooling, to a central shakeout.

actly alike in their building layouts, molding machines, patterns, ideas, operating methods, and management.

Flexibility is of utmost importance in considering mold handling, particularly in the small foundry, on account of the wide variety of work that must be handled and because of frequent changes in classes of work to suit production requirements.

Because of tremendous savings in floor space by the use of mold handling equipment, as compared with floor methods, it is usually possible to arrange an effective layout for mechanical devices for old foundries, with minor building alterations.

Manual handling of molds is uneconomical. For light and medium work, for molds weighing up to 250 lb, mechanical mold handling equipment is well justified where a production of 1500 or more molds per day is involved. For heavier work, a mechanical device has been a necessity, and it is a question of the speediest and most economical method. Crane, jib, and hoist, operated manually, electrically, or by air, have all proved profitable for handling heavy molds.

Unfortunately, the problems of mechanizing a small foundry are much more complex than for a large production foundry. This is particularly true of jobbing foundries in which the class of work may vary widely from week to week, and where management has little control over the type of work that must be produced. Certain fundamental factors, however, apply to both the small and large foundry.

Regardless of size, foundries planning to mechanize

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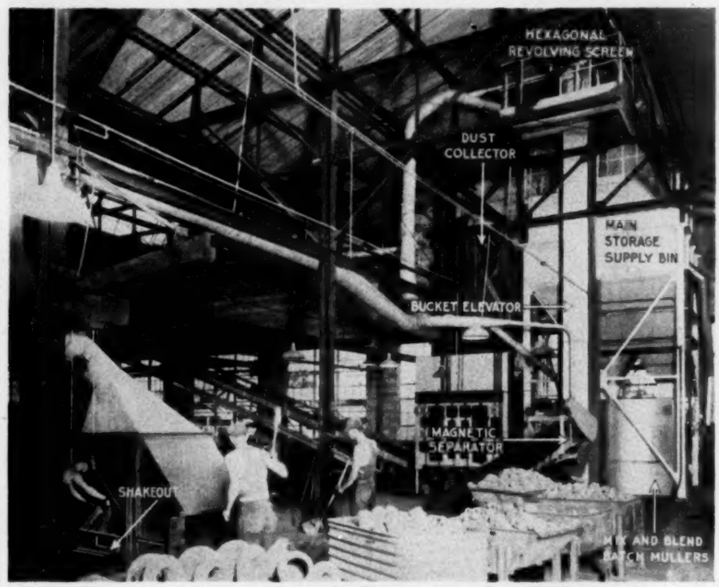
should start with a carefully considered over-all plan, even though the economics of complete mechanization cannot be foreseen immediately. Thus, units may be installed step by step, always following the over-all plan and allowing for readjustments and careful selection of work to be placed on the mold and sand handling systems, as the organization develops experience in their usefulness. Often, it is better to take this step-by-step approach, even though the economics of complete mechanization are indicated in the beginning.

In developing the over-all plan and program, the movement of product from raw materials to finished castings should be carefully analyzed to produce straight-line flow. The most important single factor that the foundry engineer must have foremost in his thinking is flexibility of operation. A foundry should be designed so as to be able to function efficiently at half capacity as well as at full or over capacity.

Small jobbing shops making one of this or two of that, and having little or no repetitive work (perhaps an average melt of 10 tons per day), require little more than straight floor operation with a minimum of equipment. On the other hand, small foundries that are not justified in complete mechanization of even a single unit can profit from a small compact central sand reclamation and facing sand plant. Such units are standardized and will prove an attractive investment for most jobbing shops.

Standard units have been developed for mechanization of one or two molding stations, which is an economical arrangement for the small foundry that cannot justify a



This modern foundry installation includes a central shakeout, magnetic belt, elevator, and sand preparation plant, with a dust collecting system at the transfer points of belt conveyors, elevator, and screens.

Snap flask molding lines can be arranged with pallet type mold carrying conveyors. The pallets are made of a light structural frame supported on grooved rollers operating on angle track. The tilting device at the end of the pallet line (left, below) dumps the molds, the bottom board being retained on the pallet and automatically returned to the molding station (right) on a lower level track under the mold carrying line. Counterweights raise the unit to loading position.

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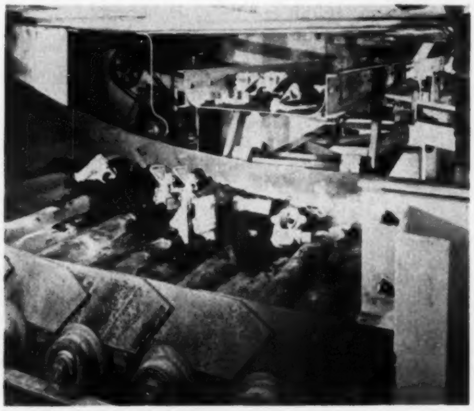
Hot castings from the shake- ➡ out are handled on an apron conveyor. Sprues are removed and the castings sorted on the conveyor.

⬇ A 36-in. oscillating conveyor handles hot sand and castings from snap flask conveyor to shakeout apron conveyor. No spillage of material occurs on the oscillating conveyor as there is no return run.

⬇ This automatic shakeout (right, below) for tight flasks is synchronized with and operated from the continuous car conveyor. The shakeout machine picks up flasks from each car, moves over to a discharge opening and vibrates the flask so that sand and castings drop out on conveyor below, then travels forward and returns empty flask to conveyor car, repeating the cycle for each flask while conveyor is in continuous operation.



complete sand conditioning unit. A unit of this type would consist of a belt feeder, elevator, and aerator discharging to a single or twin molder's hopper, thus providing the molder with overhead prepared sand.

In addition, there are many individual materials handling operations in small foundries that can be mechanized, but which do not require a complete system. These operations can be mechanized to eliminate drudgery and hazards and, at the same time, reduce operating costs.

In analyzing foundry mechanization, it is necessary to keep in mind an over-all picture of the complete operation from raw material to finished casting so that all departments can take full advantage of the investment. In the small foundry, flexibility of operation is of prime importance, particularly in the jobbing shop, and an over-all program of mechanization should be outlined and carefully studied.

Mechanization should start with a carefully considered over-all plan. Usually it is preferable to install units step by step even though the economics of complete mechanization are indicated in the beginning. This will allow for readjustments and for careful selection of the kind of work to be placed on the system.

CORE PRACTICE AS RELATED TO MALLEABLE FOUNDRY LOSSES

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National Malleable & Steel Castings Co.
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EVERY DAY IN EVERY FOUNDRY a great amount of effort is expended in reducing casting losses and improving quality levels. The reasons for this are obvious—efficiency, costs, and customer satisfaction.

Since many scrap castings may be the result of more than one cause, it is not always easy to pin down the practice which results in foundry losses. The most important factor in overcoming any type of scrap is the use of the powers of observation. This may be a case of merely looking at a scrap casting critically and visualizing what must have happened to produce it, or by correlating operating or experimental data with resulting quality levels by statistical means. Unless an open minded approach by all concerned is adopted, and unless an intelligent analysis based on thorough observation is made, it is extremely difficult to overcome foundry losses.

Since this discussion of losses is to consider only the effect of core practice, it is well to first point out that the part which cores may play in the production of castings which are scrapped or require salvage operations, is not always obvious. Because of this, scrap produced by cores often is not charged to the coreroom. On the other hand, the coreroom supervisor may be charged with scrap which is not caused by the core practice, due to faulty analysis.

Accurate Scrap Analysis Needed

As an example of this the case of a large and complicated casting being scrapped because of a thin section in the drag can be cited. This scrap, which amounted to about 4 per cent of the castings produced, had been analyzed by the molding foreman as being caused by sagging cores. The coreroom foreman, who had observed the scrap castings with the molding foreman, had accepted responsibility for the losses and was trying in several ways to eliminate the core sag.

This situation had existed for several months with occasional improvement, but the loss was not permanently eliminated. Finally, at the suggestion of an outsider, a gage was made to check the cores for sagging. No sag was found, and in some cases the core was off in the opposite direction. Further observation showed that the thin drag sections were caused by the molders placing the drag mold on dirty bottom boards, which cause the drag mold face to be pushed up.

Incidental to this situation, a large increase in the occurrence of hot tears in this casting resulted because the coreroom had gradually increased the hardness and strength of the body core to the point where it restricted the normal contraction of the metal in the sections around the core.

The fact that situations such as that related in the foregoing example exist, indicates that in order to reduce foundry losses it is necessary that all concerned have the ability to use the apparent facts to solve the problem. Coreroom supervision should become acquainted with the various types of scrap for which it might be responsible, and also that which the other foundry departments might cause. Since in many cases the supervision in a department comes up through that department, it often is not familiar with the problems of others.

At times in the core department the scrap is not conveniently seen, and it is advisable for core personnel to make a daily practice of reviewing the scrap, and by so doing gain knowledge and experience from the problem encountered. Some of the specific types of defects for which the coreroom may be responsible, and means which have been successful in eliminating them, are discussed in the following.

Hot tears result when the restricting forces set up by the mold or core are greater than the ultimate strength of the metal during the cooling period after solidification. In this case the desirable approaches are to increase the ultimate strength of the metal, or reduce the restricting forces.

Here the coreroom is charged with the responsibility of producing a core which will have properties such that it will offer a minimum resistance to the contracting metal. This problem has been attacked in many ways and with varying degrees of success.

One method which has been found quite effective is that of controlling core density or, more simply, core weights. This requires proper ramming of the core in hand-ramming operations. To obtain a core of minimum density requires the least amount of ramming commensurate with retaining sufficient dimensional stability. In the writer's shop it has been found that to control cracking tendencies on a particular casting, it is necessary to hold the weight of an internal core to 12 lb maximum weight.

Control Core Ramming

It has been proved that cores weighing 13 lb will produce 100 per cent hot tears. On the other hand, it has been found that cores rammed to 11½ pounds tend to sag, with resultant loss in holding dimensions. To obtain this degree of control requires that the coremaker be carefully trained, since the surface of the core must be well packed to avoid casting roughness while the body of the core be softly rammed.

In making such a core the coremaker's only tool is the strike-off. He is not permitted to use any aid to ramming other than skillful use of his hands. The sand for such cores is made by blending base sands of different finenesses so that the grain is distributed over six sieves. Sufficient cereal is used to bond the

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sand to about 1.2 psi green strength. With this sand practice sufficient green strength is obtained from the spread of grains and cereal for the core to maintain its shape. The grain distribution spread also helps to maintain desired casting surface finishes without the use of core washes, in spite of the soft ramming.

Control of this practice is maintained by weighing the cores at random as they come from the ovens. When core weights exceed the desired minimum, the core supervisor is immediately notified and takes corrective action. This practice has, in some cases, been found to warrant making a job by hand rather than on the coreblower.

In cases where hot tears persist in spite of controlled core weights, it has been found helpful to use a filler in the sand. So far the most effective filler found has been sawdust, which means materials having a particle size of about 20 mesh. This material used in proportions up to 25 per cent by volume has been quite effective. The use of wood flour in equal amounts, in the author's experience, had not been nearly as effective. There are undoubtedly other fillers available and in use which would be equal to sawdust, but from the standpoint of costs and results sawdust has been quite satisfactory.

Some Objections to Sawdust in Cores

There are certain objections to the use of sawdust which are well founded. The greatest disadvantage is its effects on casting surfaces, where it produces undesirable roughness. This can be overcome where conditions are most abusive to the core by the use of core washes. Where conditions in the mold are such that cores are not submitted to excessive erosion or heat, the use of sand mixtures with broad grain distribution, as previously mentioned, seems to be sufficient.

Another disadvantage often mentioned is that heaps or sand systems become increasingly filled with sawdust. The author has never seen this condition exist. However, if such a condition should arise, it would be a matter of considering the various factors involved and determining a proper course of action. Sawdust also has the undesirable characteristic of weakening the cores in the dry state and careful handling is required. This can be helped by judicious use of high dry strength facing and rods. Because of its disadvantages the use of sawdust is indicated where no other means of reducing hot tears is effective either in the foundry or coreroom.

A combination of the two aforementioned practices appears to be the limit to which the coreroom can go in helping to overcome hot tears. However, there are other steps which can and should be taken in all cases. It is desirable to always use the least amount of binder commensurate with core handling. The use of extremely fine sands or sand containing clay should be held to a minimum.

Proper baking is desirable because the presence of unoxidized core oils results in an exothermic reaction which would have an adverse effect on casting hot spots. Keeping the moisture contents of core sands at a minimum is desirable, since increasing moisture contents result in increasing all core properties which would tend to promote hot tearing.

It should be remembered that not all hot tears are the result of core conditions. In nearly all cases the causes of hot tears are the result of several factors acting simultaneously. However, careful analysis of how stresses are acting in a casting prone to hot tear will indicate whether or not cores are a contributing factor. If it can be seen that cores may be a factor, then steps should be taken to correct the condition and practices devised for that purpose be maintained by some form of control.

Strain cracks are the result of uneven cooling of different casting sections. It is doubtful that the properties of cores have any great effect on the occurrence of strain cracks. However, it has been found that in mechanized shops where shakeout occurs shortly after pouring, the time required for a core to shake out may have some effect on strain cracks.

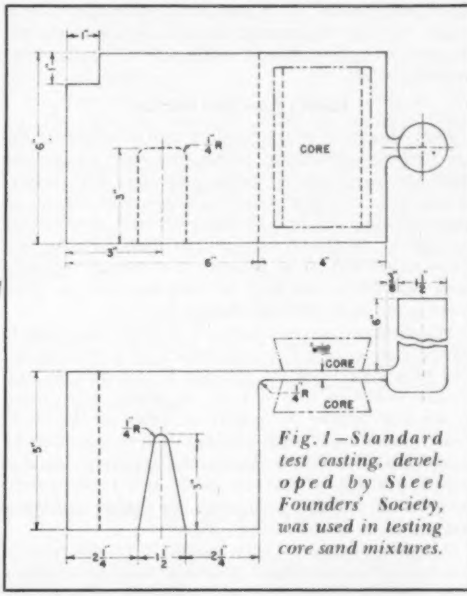


Fig. 1—Standard test casting, developed by Steel Founders' Society, was used in testing core sand mixtures.

It was noticed that in a hub casting where the hub core disintegrated and ran out of the casting rapidly, there was less tendency toward strain cracks than when the core sand was retained in the casting. Apparently the reason for this was that the rapidly disintegrating core allowed air to penetrate to the heavy sections of the casting, thereby cooling it faster in relation to the lighter flange. More even cooling reduced the strains usually set up with less collapsible cores. This practice was controlled by holding core sand moistures to a minimum.

Core scabs and cuts are the result of intergranular expansion of the sand grains of the core sand mixture. They are usually found in locations which are subject to abuse from the metal entering the mold, and if they are sufficiently serious may develop into what is known as a core cut.

The circumstances present when a core cut or scab appears indicate insufficient strength of the sand at

high temperatures. This lack of high temperature strength can be rectified by additions to the sand mixture of silica flour in sufficient amounts, usually at least 20 per cent by weight. The use of core wash cannot be strongly relied upon to prevent scabs or washes.

For experimental or control purposes a very useful tool is the sand test block shown in Fig. 1. Experimental core sand mixtures can be made up into ram-up cores, which are rammed up in the mold at cope and drag of the plate section of the pattern. Since the entire casting is poured through this plate section, the cores being tested will receive extreme abuse from the flowing metal. If a mixture is produced which resists cutting or washing in this application, the chances are great that it will perform quite satisfactorily in use.

Reduce Core Gas Pressure

Core blows may be the result of core conditions if the gas pressures developed within the core are greater than the surrounding metal pressures. The logical approach to this problem is to reduce the amount of gas-producing material in the core sand mixture, or to improve the core baking process. However, the core gas pressure and metal pressure relationship are often such that additional help in reducing core gas pressures is required through the use of vents.

When vents are necessary they must be properly placed and made. The appearance of a hole in the end of a core print should not be accepted as conclusive evidence that a core is vented. Very often blows will appear at feeders or gates of the cored heavier sections of light castings. These can often be traced to the core. The reason they appear at the gate mouth probably is that the metal here remains fluid longer than in other sections of the casting and offers less resistance to the passage of gases.

Another source of core blows is in the use of patching material. Core patching materials usually contain high percentages of gas producing materials. This concentration of gas producers in a small area where cores may be patched because of chipping or carelessness can easily result in blows. The best remedy for this condition is to make and handle cores in such a manner that patching is not necessary. Where the use of mud is necessary, as around paste-in cores, it should be used in as small amounts as possible and carefully dried.

Finer Core Sands Improve Casting Surface

The use of core washes sometimes resulted in the presence of very small blows about 1/8 in. in diameter throughout sections of a casting. When washed cores were applied to the plate section of the test block (Fig. 1), these small blows were often found in the plate sections of the casting. Wherever possible it has been found desirable to improve casting surface conditions by the use of finer sands in the core mixture.

Penetration and Rough Surfaces: Casting buyers have become more and more demanding for smooth surfaced castings free from adherent sand grains. The use of washes with cores certainly improves surface conditions; however, aside from the fact that this adds costs of labor and materials to the finished product, it often results in the presence of small gas holes in the casting which are not uncovered until the machining operation.

Except in most severe cases surface finishes can be satisfactorily controlled through the sands used in the core mixtures, without appreciable cost increases. The judicious blending of base sands in such a manner as to produce a five or six sieve sand, with 10 to 15 per cent of the grains below the No. 100 sieve, will result in desirable finishes in most cases.

The use of excessive fine material or clay containing sands will result in the need for more binder, thus increasing costs and the possibility of blows. However, a study of the sands available and sufficient experimentation has provided core mixtures requiring no more than the usual amounts of binders, and highly satisfactory finishes.

Poor packing or ramming of cores results in poor casting surfaces. There is no substitute for proper ramming, and no other steps to improve finish should be considered until satisfactory ramming is attained.

Watch Gating System Cores

Dirt appearing in cope surfaces of castings can often be attributed to core failures. This dirt may be the result of a core cut or scab, and where this is the case it is not difficult to uncover the source. However, if the dirt occurs with no appearance of a source, it is wise to examine the sprue of the casting at points where cores are used in the gating system. It is sometimes found that skim cores or gate cores may be disintegrating under the flow of metal.

While gate cores may appear insignificant, upon failure they suddenly become the most important core in a mold. It has been found that the best insurance against this possibility is the use of silica flour in the sand mixtures for gate cores, especially for heavy work.

Dimensional Variations in Castings: The manner in which a core is handled may result in variations in casting dimension. Where this dimensional instability is great enough it may cause misruns or crushes, which are easily identified in a hard iron casting. However, these discrepancies may be such that a casting will pass hard iron inspection and be broken in finishing operations in an attempt to make it meet the gages, or it may fail in service.

These conditions may be caused by excessive jolting of core boxes after the core is rammed and before the box is drawn, soft ramming, inaccurate dryers, weak sand, core box wear, or careless clamping of core boxes prior to making the core. Where a critical casting dimension is determined by a core, the use of gages or rubbing jigs is mandatory, at least for spot checking.

Shrinks: Cores can sometimes be an indirect cause of shrinks by creating hot spots at undesirable points in castings. It has long been known that the presence of unoxidized core oil may produce an exothermic reaction when it comes in contact with molten metal. Thus cores which have not been properly baked can produce hot spots with, resultant shrinks. It has been found that this heat-producing reaction does not occur in resin-bonded sands, which normally require less baking than oil-bonded sands.

Proper baking of oil cores in dryers requires that the vent holes placed in the dryer at the core surface

have access to the atmosphere. Sometimes in the making of a dryer the core supporting surface is well vented with holes, but access of these holes to the atmosphere is prevented by the side and end supporting members of the drier. If some means of introducing air to the surface of the core in a form dryer is not available, that surface of the core can never be properly baked.

Misruns and Cold Shuts: It has been said many times that molten metal will not "lay to" a hard, smooth core surface, and that hard core surfaces will result in misruns and cold shuts. A reasonable explanation would seem to be that hard, smooth cores usually have a high ratio of gas content to volume of core. When this gas is freed by the action of heat, the pressure produced in the mold and the chilling action of the gases must certainly affect the ability of the iron to run the casting.

Unfortunately, we often have this condition in castings for which the cores are intricate and easily broken. Where this is the case, the binder content of the cores is increased to overcome excessive core breakage. When this is done, the conditions affecting misruns are naturally worsened. If possible, cores for such castings should be made as weak as possible and handled with great care. Scrap cores are undesirable, but less so than scrap castings.

Sometimes this condition is improved by roughening cores with sand paper. This results in rough surfaces and is not a satisfactory solution where surface finish is important.

Where core conditions as above cannot be conveniently obtained, the foundry should consider improved gating as a means of bettering the condition.

Summary

The author realizes that the foregoing discussion of defects resulting from cores is not complete, although the more common ones are presented. It is suggested that the following steps be taken in attempts to reduce losses resulting from core practices.

1. A systematic method of scrap analysis should be set up and should include the coreroom personnel. Failure to accurately determine causes or possible causes of scrap only confuses the situation.
2. Possible causes of defectives should be investigated and positive causes determined.
3. A practice should be decided upon for correction of the defects.
4. After the above steps are taken, the most important phase follows—controlling the practice within the limits necessary to eliminate scrap. In core departments where the supervisory load is heavy, it may be desirable to install personnel whose primary function is that of controlling quality. Any aid to visual inspection of cores such as gages, jigs, and testing equipment should be available for quality control.

Acknowledgment

The material herein presented is not entirely original with the author, but has become available through the work of many foundrymen whom the author desires to acknowledge.

Metals Publication Editors Meet With NPA In Washington

Representatives of national metals publications meeting with National Production Authority officials in Washingon, D. C., January 17 to discuss how the NPA program affects metals industry production were, starting left clockwise around table: J. C. Fox, *Mining Congress Journal;* H. L. Moffett, *American Mining;* J. V. Beall, *Mining Engineering;* J. Haydock, *Metal Working;* J. Zimmerman, *Daily Metal Reporter;* William G. Gude, *The Foundry;* E. J. Hardy, *Iron Age;* F. H. Hayes, acting director, Copper Division and Miscellaneous Metals and Minerals Division, NPA; W. W. Hopton, acting director, Tin, Lead and Zinc Division, NPA; Wm. W. Maloney, AMERICAN FOUNDRYMAN; I. H. Such, *Steel;* E. E. Thum, *Metal Progress;* C. S. J. Trench, *American Metal Market;* E. Just and A. M. Staehle, *Engineering & Mining.*

SAND, MECHANIZATION, MELTING HIGHLIGHT WISCONSIN REGIONAL

TWENTY TECHNICAL MEETINGS in the fields of gray iron, steel, malleable iron, non-ferrous alloys, and patterns gave attendants at the 14th Annual Regional Foundry Conference of the Wisconsin Chapter an opportunity to hear some of the leading foundrymen of the United States and Canada. Held at the Hotel Schroeder in Milwaukee, February 8 and 9, the conference was under the direction of George E. Tisdale, Zenith Foundry Co., chapter vice-president.

The conference was opened by Chapter President Walter W. Edens, Badger Brass & Aluminum Foundry Co., who presided at the first session. Dean M. O. Withey, University of Wisconsin, the first speaker, explained factors affecting the supply of graduate engineers and predicted a shortage for the next four years.

Introduced by G. J. Barker, University of Wisconsin, National President Walton L. Woody, spoke on *"Your A.F.S."* He outlined the activities of the Society, describing the nine research projects, the current program to provide a permanent headquarters for A.F.S., and the safety, hygiene, and air pollution program.

Luncheon speaker was George K. Dreher, Foundry Educational Foundation, Cleveland. He pointed out how much better prepared the foundry industry is, in comparison with a decade ago, to meet the high production requirements it now faces. Presiding at the luncheon was Conference Chairman Tisdale.

The afternoon of the first day and the second day of the conference were devoted to four sets of five simultaneous technical meetings—gray iron, steel, malleable, non-ferrous, and pattern. The conference banquet which ended the first day's activity featured an address by Fred A. Hartley, Jr., Washington representative of the National Foundry Association. Banquet chairman was Chapter President Edens. At the second day's luncheon the speaker was Austin H. Kiplinger, Chicago news commentator. J. G. Risney, Risney Foundry Equipment Co., presided.

First gray iron speaker was A. J. Busch, Chas. C. Kawin Co., Chicago; chairman and co-chairman of the session were, respectively, Leo Koenig, J. I. Case Co., Racine, Wis., and A. R. Janes, Jr., Standard Foundry Co., Racine. Mr. Busch, speaking on *"Cupola Operation with High Scrap Mixture,"* said that scrap must be properly cleaned and contaminating materials removed, and that gating and risering must be changed in many cases when using much scrap.

Professor Phillip C. Rosenthal and Lew E. Porter, University of Wisconsin, described a modified fluidity test (spiral gated at inside) for gray iron and gave a formula for predicting fluidity for chemical analysis and degrees of superheat above the liquidus.

Fourteen types of casting defects can be caused by sand George Anselman, Beloit Foundry Co., Beloit, Wis., told his listeners at the third gray iron session. Harry Johnson, Walter Gerlinger, Inc., was chairman; co-chairman was George Antonic, Motor Castings Co., Milwaukee. Simplification of sand problems and reduction in defects can be achieved through use of a minimum number of mixtures, Mr. Anselman said.

"The Modern Foundry—Design, Operation, & Maintenance" was the topic of E. E. Ballard, Lester B. Knight & Associates, Chicago. He told his listeners that some foundries still have a long way to go toward modernization. He stressed foundry housekeeping and safety. Presiding at the meeting were Leslie Woehlke, Grede Foundries, Inc., Milwaukee, and Clifford Schwann, Brillion Iron Works, Brillion, Wis.

AMERICAN FOUNDRYMAN reporters for the Wisconsin Regional Conference were Publicity Chairman D. M. Gerlinger, Walter Gerlinger, Inc., E. G. Tetzlaff, Pelton Steel Casting Co., Arthur R. Janes, Standard Foundry Co., Ralph N. Schaper, Wisconsin Appleton Co., John H. Kammermeyer, American Smelting & Refining Co., and Carl Van Buren, Allis-Chalmers Mfg. Co.

The four speakers at the steel sessions and their topics were: J. B. Caine, Cincinnati—*"Gates and Risers;"* S. L. Gertsman, Dept. of Mines & Technical Surveys, Ottawa, Ont., Canada—*"Metal Penetration in Steel Castings;"* Prof. Howard F. Taylor, Massachusetts Institute of Technology—*"Riser Compounds;"* and J. D. Wozny, American Steel Foundries, East Chicago, Ind.—*"Repair Welding of Steel Castings."*

There is no need to consider hydraulics or a scientific approach to gating if we do not observe good molding practices in making gates, Mr. Caine declared. Recent movies have exploded many opinions and have given foundrymen facts, he stated. Riser sizes can be and are being determined mathematically, Caine said. Co-chairmen were George V. Jedinak, Sivyer Steel Casting Co., and Oscar H. Kraft, Bucyrus-Erie Co.

In the meeting on penetration, Mr. Gertsman said penetration can be eliminated or reduced by (1) low pouring temperature, where feasible, (2) proper ramming, (3) use of fine grain sand or silica flour additions, and (4) proper use of effective washes. Presiding at the session was W. Punko, Wehr Steel Co., with Paul C. Fuerst, Falk Corp., as co-chairman.

Professor Taylor reminded listeners to his talk on riser compounds that risers should not be filled to the top—an overflow fin acts as a cooling fin, and a full riser allows no room for riser compound. He described proper use of the five types of riser compounds. G. E. Schneider, Grede Foundries, Inc., and Harold A. Ziebell, Crucible Steel Casting Co., were co-chairmen.

Development of rods for repair welding of Grades B and C and 1040 steels were described by Mr. Wozny. Session co-chairmen were Anthony M. Herrmann, Racine Steel Castings Co., Racine, Wis., and Victor E. Ziemer, Maynard Electric Steel Castings Co.

Attendants at first non-ferrous meeting heard E. B. Rich, American Wheelabrator & Equipment Corp., Mishawaka, Ind., H. G. Jackson, Chicago Pneumatic Tool Co., B. H. Work, Carborundum Co., Niagara Falls, N.Y., and J. G. Bair, Fox Grinders, Inc., Phila-

delphia, in a panel discussion entitled *"What's Wrong in Your Cleaning Room?"* Emphasis was placed on good maintenance of equipment and proper training of operators to reduce costs and increase efficiency. Presiding was Kenneth L. Jacobs, Standard Brass Works; co-chairman was M. E. Nevins, Wisconsin Centrifugal Foundry Co.

"Mechanization of Small Jobbing Foundries" was described by L. G. Probst, National Engineering Co., at a session chairmanned by Duane Bosma, Bucyrus-Erie Co., and John L. Kammermeyer, Federated Metals Div., American Smelting & Refining Co. The speaker told how foundries with as few as four molders could justify mechanization.

J. G. Winget, Reda Pump Co., Bartlesville, Okla., discussed design and operation of a fast-melting furnace suitable for non-ferrous or ferrous melting. Atmosphere is reducing, he said. Lawrance J. Andres, Lawran Foundry Co., and John Bradisse, Specialty Brass Co., Kenosha, Wis., presided.

James O'Keefe, Exomet, Inc., Conneaut, Ohio, explained methods for improving riser efficiency at a session presided over by Casey Kotowicz, Ampco Metal, Inc., and Carl Van Buren, Allis-Chalmers Mfg. Co. He recommended cylindrical risers, chills, insulation of the riser, and use of exothermic materials.

Leading off for the malleable iron speakers was A. S. Rakestraw, Norton Co., Chicago who told how to make the most of high speed grinding in the malleable cleaning room. Co-chairman P. H. Carlson, also of Norton, showed a motion picture, *"Grinding Wheel Safety."* Chairman of the meeting was Jos. C. Kropka, Chain Belt Co.

"Dielectric Core Baking" was the subject of J. Robert Roe and John Dawson, Allis-Chalmers Mfg. Co., who outlined the advantages and disadvantages of this method of baking and the binders used. Chairman and co-chairman, respectively, were Norman Amrhein, Federal Malleable Co., and P. J. Anderson, International Harvester Co.

Third malleable iron speaker was Clyde A. Sanders, American Colloid Co., Chicago, who described the influence of sand on casting shrinkage (AMERICAN FOUNDRYMAN, February 1950, page 49). M. A. Harder, Lakeside Malleable Casting Co., and H. C. Stone, Belle City Malleable Iron Co., both of Racine, Wis., were co-chairmen.

Concluding malleable paper was *"Heat Treatment of Malleable Irons"* by Professor R. Schneidewind, University of Michigan. He discussed plain and pearlitic malleable and nodular iron. Four major factors in determining how to heat treat malleable irons, he said, are temperature, section size, silicon content, and rate of heating. Presiding were Mr. Stone and Ralph N. Schaper, Wisconsin Appleton Co.

Pattern session attendants heard: John Klement, Ampco Metal, Inc., speak on *"Croning Molding Process;"* George Antonic, Motor Casting Co., on *"Foundryman's Attitude Toward Pattern Equipment;"* P. Butzin, Delta Mfg. Co., whose subject was *"Value of the Patternmaker to Modern Casting Engineering;"* and A. F. Pfeiffer, Allis Chalmers Mfg. Co., on *"Drag and Cope Dual Production."* Mr. Klement described the shell molding process in detail and said it was advantageous for high production shops making castings with close dimensional tolerances. Initial cost of production facilities is high and he did not recommend it for job shops. W. Kollmorgen, Kollmorgen Pattern Works, and Alfred M. Fischer, Chas. Jurack Co., presided at Klement's session.

Cheap patterns are expensive to the foundry, said Mr. Antonic, in outlining his preferences for a co-operative arrangement between foundries and patternshops. Co-chairmen of his session were M. C. Frankard, Delta Mfg. Co., and J. Anderes, Belle City Malleable Iron Co.

The concluding pattern session featured Mr. Pfeiffer in a description of a simple method for utilizing both cope and drag to double production at only slightly higher cost.

Planning The 1951 Wisconsin Regional Foundry Conference

Some of the foundrymen who made the 1951 Wisconsin Regional Foundry Conference a success are these, photographed at a pre-conference meeting. Left to right are: D. M. Gerlinger, Walter Gerlinger, Inc.; E. C. Meagher, Federal Foundry Supply Co.; W. W. Edens, Badger Brass & Aluminum Foundry Co, chapter president; A. F. Pfeiffer, Allis-Chalmers Mfg. Co., program chairman; George E. Tisdale, Zenith Foundry Co., conference chairman and chapter vice-president; Leon H. Decker, Allis-Chalmers, treasurer; and Prof. E. R. Shorey, University of Wisconsin, an associate chairman of the conference. Photo by Walter V. Napp, Badger Firebrick & Supply Co.

BOARD OF DIRECTORS CONSIDERS MID-YEAR PROGRESS OF SOCIETY

A.F.S. Board of Directors held its customary mid-year meeting January 25-26 at the Blackstone Hotel, Chicago, to consider reports of committees and staff officers on a number of subjects.

Headed by President Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, and Vice-President Walter L. Seelbach, Superior Foundry, Inc., Cleveland, Directors attending were:

T. H. Benners, Jr., T. H. Benners & Co., Birmingham, Ala.; N. J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio; Robert Gregg, Reliance Regulator Div., American Meter Co., Alhambra, Calif.; E. W. Horlebein, Gibson & Kirk Co., Baltimore.

M. J. O'Brien, Jr., Symington-Gould Corp., Depew, N. Y.; V. E. Zang, Unitcast Corp., Toledo, Ohio; T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; L. C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill.

V. J. Sedlon, Master Pattern Co., Cleveland; F. G. Sefing, International Nickel Co., New York; L. D. Wright, U. S. Radiator Corp., Geneva, N. Y., J. J. McFadyen, Galt Malleable Iron Co., Ltd., Galt, Ont., Canada; F. W. Shipley, Caterpillar Tractor Co., Peoria, Ill.; James Thomson, Continental Foundry & Machine Co., East Chicago, Ind.

Directors unable to attend were J. O. Ostergren, Lakey Foundry & Machine Co., Muskegon, Mich., and E. C. Troy, Palmyra, N. J.

Membership

The report of National Secretary Wm. W. Maloney showed that membership in the Society as of December 31, 1950, totaled 9089, indicating a substantial gain since June 30, 1950. He reported that all Chapter Membership Chairmen were active in regaining lost members and in obtaining new members, stating that concentration on war production undoubtedly results in material membership gains.

The Secretary announced that a new Student Chapter at the University of Alabama soon would be installed during the Birmingham Regional Foundry Conference. His report was tied in with a second report from Vice-President Seelbach, as Chairman of the Chapter Contacts Committee, indicating that by the end of the current fiscal year, practically every Chapter will have been visited by some national officer, director or staff member.

Finances

Treasurer Maloney reported that the Finances of the Society were proceeding as expected as of December 31, with Income exceeding estimates and Expense running below estimates. He stated that Income during the first six months totaled $230,735, or 62 per cent of the year's Income budget of $370,500, and that Expense totaled $218,861, or 49 per cent of the year's Expense budget of $442,730. As a result, he reported an Excess Income of $34,894 for the first six months.

The financial report forecast Income from membership dues of $200,000 for the year, and an Income from display advertising in American Foundryman greater than in any previous fiscal year.

The Treasurer suggested that cash held in banks in excess of amounts required for operating purposes during the next 12 months should be invested as recommended by the Finance Committee. The Board of Directors approved and suggested that U. S. Government securities be purchased for the time being.

Technical Report

The semi-annual report of Technical Director S. C. Massari detailed progress being made in the seven going research projects of the Society, sponsored by the Aluminum & Magnesium, Brass & Bronze, Gray Iron, Malleable Iron, Sand, and Steel Divisions, and on the subject of heat transfer.

He stated that work on centrifugal casting now is being carried on exclusively by the Canadian Bureau of Mines, and that the Cupola Research Project of A.F.S. is temporarily in abeyance pending receipt of recommendations from a re-organized Cupola Research Steering Committee.

The Technical Director reported that he expected between 50 and 60 papers for the 1951 Convention in Buffalo to be available for reprinting prior to the Convention, and that a total of 125 entries is indicated in the 1951 Apprentice Contest.

The report indicated that nine special publications were approved for the current fiscal year—two had been completed and published, Engineering Properties of Cast Iron, and Gray Iron Research Progress Report, II (manuscript completed and in the hands of committees for approval); that a Sand-Steel Symposium soon will be produced; that the Sand Handbook revision is now complete and that a Foundry Terminology Glossary is nearing completion. Manuscripts for the College Foundry Text, the Patternmakers' Manual, and Metallography of Cast Metals are still in work and progressing.

Reports on activities of the following organizations were presented: Past President E. W. Horlebein, as President of the National Casting Council; Director N. J. Dunbeck, as Chairman of the Research Committee of the Board; Vice-President Seelbach, as Chairman of the Safety & Hygiene Committee of the Board; Past President Horlebein, as Chairman of the Board of Policy Steering Committee.

Past President Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., attended the meeting as Chairman of the A.F.S. Housing Committee and reported that the A.F.S. Building Fund was approximately $73,000 as of January 25. He reported plans for further development of the program through broadening of the opportunity to contribute to a Permanent Headquarters Building.

Minutes of the meeting of the Board of Awards held December 14 were presented and approved, together with recommendations for the awarding of Gold Medals and Life Memberships at the 1951 Convention.

Questions THE ROUND TABLE Answers

MORE ABOUT AIR POLLUTION PROBLEMS

METEOROLOGICAL CONDITIONS AFFECTING AIR POLLUTION

A. H. Eichmeier
Michigan Section Director
U. S. Weather Bureau, East Lansing, Mich.

INDUSTRIAL AIR POLLUTION problems are not new, although they have increased greatly with industrial expansion. Arnold Marsh in his book, *Smoke*, concerning the coal problem in England, states that as early as the year 1257 coal was being used in the provinces and the smoke of Nottingham was such that Queen Elinor, who was staying there while Henry III led an expedition into Wales, was unable to remain in the city and moved to Tutbury. By the end of the 13th century, the quantity of coal used in London had increased considerably, and the smoke was especially noticed by visiting nobles and others coming into the metropolis to attend Parliament.

As the result of this agitation a royal proclamation was issued in 1306 which prohibited artificers from using coal in their furnaces and commanded them to return to the fuel they had originally used. This decree seems to have had little effect despite the execution of one offender, for, in the following year, a commission was appointed to inquire of all who burned sea coal in the city or parts adjoining and to punish them for the first offense with great fines and ransoms, and, upon the second offense, to demolish their furnaces. The nuisance in those days could have been but a small thing compared to what it has become, although locally it was doubtless extremely unpleasant owing to the emission of the smoke at comparatively low levels.

The following definitions of the meteorological terminology, as applied in this paper, are from the *Weather Glossary*, U. S. Department of Commerce, Weather Bureau:

Smog: A mixture of smoke and fog.

Lapse Rate: In general, the rate of change in the value of any meteorological element with elevation. It is usually restricted to the rate of decrease of temperature with elevation. Thus, the lapse rate of temperature is synonymous with the vertical temperature gradient. The temperature lapse rate is usually positive; that is, the temperature falls off with elevation. It is negative when the temperature increases, as in the case of an inversion.

Stability: A state of vertical equilibrium in which the vertical distribution of temperature is such that an element of air will resist displacement from the level at which it is in equilibrium with its environment.

Instability: A state in which the vertical distribution of temperature is such that an air particle, if given either an upward or a downward impulse, will tend to move away with increasing speed from its original level.

Convection: In meteorology, the process when a circulation is created and maintained within a layer of the atmosphere, due either to surface heating of the bottom of the layer or to cooling at its top and consisting in the sinking of relatively heavy air and the consequent forcing up of air, which, volume for volume and under the same pressure, is relatively light.

Anticyclone: An area of relatively high pressure with closed isobars, the pressure gradient being directed from the center so that the wind blows spirally outward in a clockwise direction in the northern hemisphere, counter-clockwise in the southern.

Turbulence: In the atmosphere, the irregular local transitory variation in the general westerlies airflow, which, when vigorous as in a thunderstorm, are manifested by bumpiness, updrafts, downdrafts; and when less intense, as gustiness.

Insolation: The rate at which radiant energy is incident directly from the sun per unit horizontal area at any place on or above the surface of the earth.

The atmosphere is a vast enveloping fluid having a great mass containing approximately two and a half

A. H. Eichmeier, Michigan section director of the U.S. Weather Bureau at East Lansing, Mich., dealt with the meteorological factors affecting air pollution in the paper which he presented at the panel discussion. A 1948 graduate of Iowa State College, Mr. Eichmeier was stationed at several Weather Bureau offices prior to his present Michigan assignment.

A panel discussion on all phases of air pollution was a feature of the 1950 Michigan Regional Foundry Conference held at Michigan State College, East Lansing, Mich., Nov. 10-11, 1950. Three of the six discussions presented at the meeting—meteorology, plant life and pathology, and testing procedures—appear in this issue of AMERICAN FOUNDRYMAN. The subjects of public health, control equipment, and legal factors were presented in the February 1951 issue.

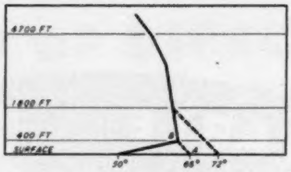


Fig. 1 (right)—A typical temperature inversion is shown in this vertical atmospheric cross sectional diagram.

Fig. 2 (below)—Diagram showing typical pressure distribution for very stable nights in Michigan areas.

million tons of air for each of the earth's two billion inhabitants and is able to absorb great quantities of pollution. Furthermore, through the aid of nature's most effective cleansing agents, rain and snow, pollutants are constantly being removed from the air, keeping the general level low. The problem then is to prevent high concentrations of pollution at or near their source. This requires sufficient dispersion and scattering into the atmosphere. The tall stacks, familiar to all of us, aid in this respect but, under certain meteorological conditions, this is not enough.

The two meteorological factors most directly involved are wind and the vertical temperature lapse rate. Wind carries the pollution away from its source and dilutes it by turbulent mixing. A strong vertical temperature lapse rate permits convection currents which spread the pollution through a greater layer, thus causing dilution. Stable air, on the other hand, confines the pollution to a narrower band and causes higher concentration to occur at the surface. The most stable air is that having an inverted lapse rate; that is, the temperature rises with altitude. This, in effect, clamps a lid on the area and, up to a certain point, allows little widening of the pollution band even when the temperature rises at the surface.

Figure 1 is a vertical cross section showing a typical temperature inversion. Dry adiabatic cooling of a parcel of air moved upward from (A) will cause it to follow a path to (B). Therefore, heating of the surface from 50 to 66 degrees would allow mixing only in the lower 400 ft. Heating of the surface to 72 degrees would widen this layer to 1800 ft. However, if the surface is warmed only a few degrees, then all the contaminants are going to remain in the lower few hundred feet. Conditions most favorable for such stability are on the back (or west) sides of weak anticyclones such as that illustrated in Fig. 2.

Figure 3 is an example of vertical temperature distribution shortly after a new outbreak of cold air. Here, lapse rates are positive, temperature falls with elevation, and heating at the surface of only 5 degrees, from 62 to 67, will allow convective currents to 1200 ft. If surface temperature rises to 73 degrees, mixing will occur to 3300 ft. In Fig. 1, a rise of 11 degrees would allow mixing to only 300 ft.

Figure 4 shows a typical pressure distribution which would produce the lapse rate shown in Fig. 3. The pressure gradient here is strong, producing good horizontal winds also. This situation then shows good mixing conditions, both horizontally and vertically.

Atmospheric dynamics are such that the strongest and lowest inversions are usually associated with weak surface winds. If the general circulation is stagnant enough for this situation to exist for several days, pollution builds up to high levels. It must be emphasized that atmospheric stagnation, concurrent with a high degree of stability, is necessary for the contaminant to accumulate. Stability accompanied by wind will not allow great accumulation.

Meteorological conditions favorable for extreme smog are associated with stagnant deep anticyclones, and past records indicate that October has the greatest frequency of occurrence of such conditions in the eastern United States. Wexler, in his studies of this matter, advances several reasons why this is true. In

Fig. 3 (left)—This cross section shows the vertical temperature distribution occurring shortly after a new outbreak of cold air.

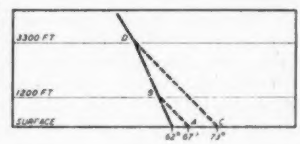
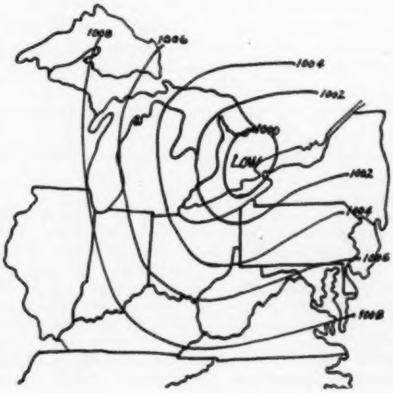


Fig. 4 (below)—Typical pressure distribution which would produce positive lapse rate and strong winds.



October, the westerlies, while strong enough to create the necessary lateral frictional stresses, are not so strong as to prevent stagnancy of the ridge to trough pattern.

If the westerlies are too strong, as occurs later in the season (winter), this anticyclone perturbation and its accompanying surface anticyclone will not persist over the area but will move eastward. The presence of suitable radiation conditions exemplified by long clear nights and short days is necessary to maintain the surface inversion. The surface inversion will be more resistant to destruction by insolation if the moisture content of the air is sufficiently large that a deep fog or stratus layer is caused by the nocturnal cooling.

Seasonal Influences

Spring, which is quite similar to Fall in many respects, differs materially in the strength of the westerlies which are quite winterlike in aspect. If a persistent anticyclone did occur over the eastern United States in the warm season, the intense solar heating during the long days would destroy the surface inversion and so prevent the accumulation of pollution, which is required over a period of two to three days to produce a heavy smog.

The topography in an industrial area has a considerable influence on the severity of air pollution. A source in a valley where the sides act as barriers may produce high concentration under special atmospheric conditions because of the limited horizontal diffusion. During persistent weak anticyclonic conditions early in Dec., 1930, in the Meuse River Valley in Belgium 63 people died as a result of an accumulation of pollution from the industrial city of Liege and nearby towns.

Under similar weather conditions, a large accumulation of pollution occurred in the Monongahela River Valley near Donora, Penn., during Oct., 1948, when 29 persons died. Figure 5 shows the rise in elevation of the valley walls at Donora. A strong inversion keeping vertical mixing below the top of these walls thus confines the pollutant to the narrow valley and causes great concentration. Also, this smog, once formed, keeps the sun's rays from penetrating to the valley surface and, with little or no daytime heating taking place, the smog tends to persist as long as the weak anticyclone exists.

In areas where the topography does not run to valleys of this kind and industrial developments are located on level to rolling land where lateral diffusion is much more effective, the smog may be irritating and grime producing, but dangerous situations are not likely to develop with ordinary industrial installations.

Minimizing Air Pollution

Pollution of the atmosphere can be minimized in a number of ways. New equipment such as precipitators, collectors, and scrubbers may be installed. In some instances plant processes may be changed to reduce air pollution. Rate of emission of pollution can be varied in accordance with weather conditions where plant processes permit. To prevent damage to vegetation in the state of Washington by sulphur dioxide from the smelter at Trail, British Columbia, an international tribunal set up by the governments of Canada and the United States established a regime for the emission of this gas based upon the prevailing weather including wind direction and speed.

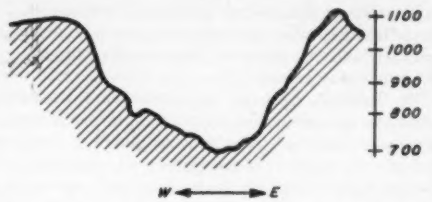


Fig. 5—A strong inversion condition which kept vertical mixing below the top of the valley walls, such as shown by the valley profile at Donora, Penn., would confine the pollutant to the narrow valley and result in great concentration.

Potential pollution problems may be avoided by proper selection of sites for industrial installations. Different dispersion characteristics in plant sites a distance of only a mile or two apart may mean pollution or no pollution. City governments could do much in this respect by having micro-climatic studies made of various available areas to determine suitability with regard to air pollution.

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TESTING PROCEDURES AND EQUIPMENT

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THE BASIC PRINCIPLE of sampling air for contamination, both inside and outside the foundry, is closely related to the degree of concentration and the specific character and behavior of the contaminant or pollutant. While a great deal of information is available on sampling techniques and equipment for health problems inside the plant, unfortunately the same situation does not exist for the atmospheric pollutants.

Air pollutants discharged by foundries are dusts from grinding, shakeouts, sand conditioning, blasting and other dust producing or liberating operations. In most instances basic information and data are available on dust characteristics, sampling procedures and equipment and dust collection equipment.

Another source of pollution is from cupolas, electric arc furnaces and other types of melting equipment. Detailed information on all phases of these pollutants is not available; however, significant data have already been published by Kane,[1] Witheridge,[2] Drake[3] and others.

Type of samples required fall into two broad classifications—stack or duct sampling to determine rate or mass emission and/or efficiency, and general atmos-

phere of the area or community involved. The former is necessary to obtain data as to the characteristics of the pollutants. This information is also of value in the formulation or revision of codes and ordinances, or for their enforcement.

The latter is necessary to determine the effect of pollutants on community health, comfort and welfare. Generally, stack or duct sampling will involve the problem of heavy concentrations of particulate or gaseous matter and, in the case of melting furnaces, high temperatures. Sampling in the general atmosphere is concerned with low or minute concentrations of the contaminant and the wide variety of weather condition found when taking samples.

Therefore, the selection of the proper sampling procedure must be based in each case on the specific requirements of the job, the equipment on hand and the skill of the operators. Selection of the proper procedure is not always simple because of the many approaches to the problem of air pollution.

Fundamental considerations necessary in the selection of the type of sampling equipment are obtaining a representative sample of the contaminated air, and samples large enough to meet the requirements of subsequent analysis such as particle size or chemical analysis and volume of gas or air sampled. The present types of sampling equipment do not, in all cases, fulfill these requirements.

In stack or duct sampling it is first necessary to obtain the average velocity and volume of air. In many instances this can be readily obtained by a pitot tube traverse. The pitot tube is not practical for measuring low velocities (below 2500 fpm) in the field because of the difficulty in obtaining an accurate low-pressure reading. Since the accuracy of the pitot tube is limited for measuring low velocities in the field, it is used mainly to determine velocities in ducts or at high-velocity exhaust and supply openings.

At times it may be difficult to obtain these readings due to inaccessibility or high temperatures, as is the case with cupolas. Further details concerning specifications and the use of the pitot tube are given in the literature.[4,5]

TABLE 1—PARTICULATE MATTER COLLECTION METHODS

Method	Advantages and Limitations
1. Electric precipitation	Quantitative collection; all particle sizes; may agglomerate particles. High sampling rate. Requires 110 AC.
2. Thermal precipitation	Quantitative collection; all particle sizes; little tendency to alter particle size. Low sampling rate.
3. Impingement: (a) standard impinger	Quantitative collection only down to 1 micron. May fracture large particles. Relatively high sampling rate. Heavy pump and 110 AC required.
(b) Midget impinger	Less efficient collection; small particles; may fracture large particles. Low sampling rate. Portable and light in weight.
(c) Impactors	Modified impingement; limited mainly to count and size studies. Excellent for sizing.
(d) Special devices, e.g., Konimeter, Owens dust counter, B & L dust counter	For dust counting only; give empirical non-standard results; often seriously in error. Lightweight; rapid; useful for comparisons.
4. Mechanical filtration: (a) Filter papers	Quantitative collection to very small size; simple equipment; some difficulty weighing and analyzing samples.
(b) Paper thimbles, cloth filters, etc.	Limited use due to difficulty of recovering sample for examination. Variable efficiencies depending on design.
(c) Chemical filters e.g., sugar, salicylic acid	High sampling rates; filter may be dissolved in solvent; danger of dirt in chemical.

Adjust Velocity for Sampling

When the average velocity has been found or assumed, the velocity of the air entering the intake of the sampling probe is adjusted to meet the approximate velocity in the stack or duct. This adjustment can be made by varying the size of the intake opening or by increasing or decreasing the volume of air handled by the vacuum pump or compressed air ejector. The provision of matching the magnitude of velocities is of special importance when the dust particles are larger than 10 microns.

The intake of the sampling probe is pointed upstream with respect to the direction of flow of the main stream carrying the contaminants. If conventional sampling equipment such as the impinger, electrostatic precipitator or an efficient filter is used at normal sampling rates with the sampling probe opening opposing the direction of the main stream (sample stream and main stream both flowing in the same direction), errors of 10 per cent or more in the determinations are found with particle sizes in the range of 10 to 15 microns.

Errors of 100 per cent occur in the particle size range of 20 to 25 microns. It is safe to predict that sampling errors would occur at much lower particle size ranges if the sample were taken in the wrong direction; for example, the sample stream flowing at right angles to the main stream. It is obvious that such sampling procedures will produce a very high error on the entry side of a dust collector if an appreciable fraction of the dust load is above 10 microns.

Sampling Cupola Gases

Data are available on sampling procedures that can be adapted to cupola gases.[6,7] However, significant findings will require considerable time and effort. A large number of samples must be taken to cover the melting cycle, and for a number of different heats in order to find the average and maximum dust loadings. The loadings can vary widely due to charging methods, type of scrap, grade of coke, and many other cupola operation factors. Therefore, many samples must be taken before a sufficiently comprehensive evaluation of dust loading for different conditions can be obtained.

Some of the problems associated with this sampling technique are high temperatures, excessive amounts of water vapor, exceedingly high amounts of solid matter, variable air velocities, and the use of small openings, 1/4 to 3/8 in. in the sampling probe in large ducts or stacks, which make it difficult to obtain a representative sample.[8] Any one of the above conditions can lead to erroneous results.

Sampling in the general atmosphere presents ad-

TABLE 2—GASEOUS MATTER COLLECTION METHODS

Method	Advantages and Limitations
1. High concentrations:	
(a) Displacement, using pipettes, bottles, etc.	Standard gas analysis methods and equipment available for most gases. High degree of accuracy.
(b) Direct reading devices	Immediate and often continuous analysis for limited number of gases. Commercial equipment; not always portable.
(c) Modifications of methods for low concentrations, listed below	Usually involves dilution to determinable concentrations. Only method for some gases.
2. Trace concentrations:	
(a) Absorption in suitable media using gas washing bottles, fritted or sintered disks, impingers, U-tubes with solid absorbents, etc.	Variety of types available; often must be used in series; choice of absorbent most critical. Most widely used method.
(b) Freeze-out traps	Limited use, owing to difficulties associated with use of liquid air, dry ice, etc. Usually a "last resort method."
(c) Adsorption, using silica gel, activated charcoal, etc.	Excellent method for most solvent vapors and other gases that will absorb. Care necessary in properly activating adsorbent.
(d) Direct reading instruments	Most desirable; available commercially for few gases; can give continuous readings and permanent records. Usually expensive.

ditional problems. It is essential that the sources and characteristics of the pollutants be known, and all too frequently this information is not available. Consideration must also be given to sources of pollutants other than those in the immediate vicinity.

In the selection of air sampling stations, attention should be given to the major sources of contamination, topographical features and population groups affected. When sampling for low concentration of airborne contaminants, special techniques may have to be developed to take in such factors as wind direction, wind speed, variations in temperature and humidity, rain and other adverse weather conditions.

The analyses of the samples collected are determined by the type of information desired. Total weight of particulate matter in a given volume of air usually can be easily obtained. However, in many instances data other than total weights are required. The physical and chemical characteristics of all the solid components are of importance. Particle size distribution data are becoming increasingly more important, and at times it may be necessary to have information on a count basis.

In obtaining samples for chemical analysis of both particulate and gaseous matter, enough of the contaminant must be collected, in suitable form, to meet the requirements of the laboratories' methods of analysis.

Most of the present sampling techniques require equipment capable of sampling a given volume of air. It is of paramount importance that this volume of air be accurately measured because it is closely related to the sampling method chosen and the results obtained. Fortunately, there are many standard methods of metering gases, and little or no difficulty is encountered in finding practical metering devices.

Tables 1 and 2 present in an outline form all of the traditional sampling methods available for sampling atmospheres for particulate matter and gaseous contaminants. Brief comment has been made of the limitations and advantages of each method. Work is now being carried on to further improve these sampling methods and develop better equipment.

Summary

The main sources of air pollutants from foundries are dust from the various operations conducted inside the plant, and particulate and gaseous matter from cupolas and other melting devices. Types of sampling required are stack or duct samples to determine the amounts and characteristics of emissions, and general atmosphere samples to determine the extent of air pollution and its effect on the area or community involved. While some sampling techniques and equipment are now available, there is a definite need for further improvements.

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TOXIC GASES EFFECT ON PLANT LIFE

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THE EFFECT OF TOXIC GAS EFFLUENTS from industrial processes on plant life will be better understood from a brief review of two of the normal processes of plant life. These processes are known as photosynthesis and respiration.

Carbon dioxide enters green growing leaf tissues through many minute openings called stomata. Inside the leaf cells containing the green pigment, chlorophyll, carbon dioxide combines with water to form the simplest carbohydrate, a hexose sugar. The water enters the plant through the roots from the soil and ascends to the leaf tissues.

Four things are necessary for the formation of this sugar, namely, carbon dioxide, water, chlorophyll, and the radiant energy of light. This process is called photosynthesis. One waste product occurs in this chemical combination. Oxygen is given off in the process and is released into the air. In the early days

of this discovery, the plant was considered to be a purifier of the air since it "took in carbon dioxide and gave off oxygen."

Other chemical compounds are formed in the plant tissues from the simple sugar. These are the more complex sugars, the starches and cellulose—in other words, the carbohydrates. Fats are also synthesized by the suitable combination of simple sugars. Proteins are formed in plant tissues when sulphur and nitrogen combine with the carbon, hydrogen and oxygen of carbohydrate compounds. These are the foods upon which the plant lives and derives its energy for growth, and materials for forming protoplasm and building cell walls of the tissues of the leaves, stems, and roots.

The plant tissues must have energy for the physiological activities of their growth. To obtain this energy another process is continually going on in growing plants, and that is the break down of these synthesized

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chemical compounds, especially the carbohydrates and the fats. The end products of their break down are carbon dioxide, water, and energy. This is principally an oxidation process called respiration, in which carbon dioxide instead of oxygen is released into the air. This is the reverse of what happens in the synthetic activities.

Summed up, a living, growing plant behaves similarly to an animal body. Both break down complex chemical compounds in their respiratory processes in order to obtain energy for life and growth. Oxygen is taken in and carbon dioxide is released. The plant differs only in having the added ability to combine carbon dioxide and water by photosynthetic activity to produce an organic compound, sugar, from inorganic chemicals. No other gases are involved in the normal physiological functions in a plant except this interchange of carbon dioxide and oxygen.

Gaseous Chemicals Cause Plant Injuries

In industrial areas there are often present in the air gaseous chemicals which infiltrate the leaf tissues through the stomata as does carbon dioxide and oxygen. The concentration of such gases may be sufficient to produce direct injury to the tissue, or when the concentration is low there may be an accumulation in the leaf tissues until toxic amounts occur and injury follows. In some cases gases may be absorbed in the droplets of dew which later evaporate leaving the toxic chemical in contact with the surface of the leaf tissue, where injury may result.

These gases are for the most part combustion products from the burning of fuels such as coal, coke, and oils, originating in roasting and smelting processes, or from foundry cupola or other apparatus where metals are melted, or where other industrial materials are made or converted such as from glass and brick furnaces or kilns, and superphosphate processing. The principal toxic gases are sulphur dioxide, fluorine compounds, chlorine, oxides of nitrogen, ammonia, and tar and asphalt gases.

Dust Materials Affect Plants

Dust materials which are effluents from industrial processes may also have a part in causing injury to growing plants. Dusts may be the result of incomplete combustion of fuels. In such cases they may carry toxic chemical compounds which can cause injury when these dusts settle on leaf surfaces, where the toxic chemicals dissolve in moisture.

Other dusts from industrial processes are usually inert and cause injury only by clogging the stomata and preventing the normal exchange of carbon dioxide and oxygen, or accumulate in sufficient thickness to reduce the amount of light reaching the chlorophyll-bearing cells of the leaves and thus cause a reduction in sugar formation. Dusts containing potassium cyanide and potassium sulphocyanate are toxic if these chemicals are in greater concentration than one per cent. As far as is known to date dusts play only a minor role in causing injury to plant tissues.

In the consideration of the effect of toxic chemicals on plants it seems desirable to confine this discussion to sulphur dioxide and fluorine compounds since they appear to be the most common offenders.

Sulphur Dioxide: This chemical compound has long been known to cause severe injury to leaf tissue of plants in places where relatively high concentrations of the gas are present in the air, usually for short intervals, or where lesser concentrations are present over long periods. In the former case acute injury results, with the leaves bleaching or turning reddish brown.

In low-growing crops the leaves are more likely to become yellowish or bleached. No doubt this is due to the fact that sulphur dioxide is heavier than air and settles to the ground, resulting in higher concentrations. Leaves of trees are more likely to turn reddish brown. Coniferous tree needles show this reddish color as a rule.

Must Study Symptoms

If the concentration of sulphur dioxide is low, but present over a long period, a chronic type of injury results. The leaves usually turn reddish brown, with green color only along the main veins. However, as new leaves are produced these too are gradually killed and turn brown. Some authorities claim that there is an invisible type of injury which brings about a reduction in growth and vigor, and is only detectable in the resultant reduction in crop yields.

Determination of sulphur-dioxide injury cannot be made by symptoms alone. This is because other factors such as nutrient deficiencies, parasitic and virus dis-

eases, and even climatic conditions such as extensive drought periods may cause similar symptoms.

In addition to a study of symptoms, actual concentrations of sulphur dioxide in air must be determined, and weather conditions such as prevailing winds, wind velocity, humidity, and temperature must be considered. Sulphur dioxide injury is increased by high light intensity, moist air, and high temperatures as well as low wind velocity.

Analyses of suspected leaves for sulphite and sulphate content may be made and compared with similar analyses of leaves from normal plants. Also, use of indicator plants such as bean, lupine, giant ragweed and oxalis may be made, as these plants are very susceptible to sulphur dioxide injury.

Most people cannot detect the presence of sulphur dioxide in the air if the concentration is less than 3 ppm. Injury to plants can occur when lesser amounts are present. Published reports show that injury may result with concentrations ranging from 1 to 40 ppm. Plant species vary in their relative susceptibility to sulphur dioxide injury, e. g., pine is injured by 2 ppm, beech by 3 ppm, and roses by 2-4 ppm.

Fluorine Compounds: Hydrogen fluoride (HF), fluosilicic acid (H_2SiF_6) and silicon tetrafluoride (SiF_4) are the principal forms of fluorine which appear as effluents from roasting, smelting, and foundry operations, as well as from several other industrial processes. This chemical is of especial interest to the foundryman because of the use of fluorspar and cryolite as cupola fluxing materials.

Fluorine Has Wide Distribution

The problem involving fluorine is not confined to its emission from the stacks and cupolas of industrial plants. Fluorine appears in soils, ground waters, and in fertilizers and if present in too great concentration not only affects the normal growth of crop plants but also constitutes a health hazard to human beings and livestock.

Injury to plant tissues appears in the form of marginal leaf burning, that is, a killing of the tissues with resultant browning, followed by unseasonably early leaf fall. In some cases there is wilting along the leaf margins before the tissue dies and dries up. Spotting of the leaves and bleaching may occur.

Symptoms are not sufficient for the diagnosis of fluorine injury. However because of the fact that fluorine accumulates in leaf tissues and even in bark, it is possible to make exact chemical determinations of fluorine present. This information can be used in comparative studies of the fluorine contents of healthy and diseased leaves in order to determine if fluorine caused the injury. Fluorine stored in the bark tissues apparently is not translocated into new leaf tissues, which indicates that fluorine injury arises by the accumulation during the current year's growth.

Fluorine contents in leaves in areas where there are no fluorine compounds in the air may be as high as 0.2 to 4.5 ppm. Fluorine contents of leaves showing injury ranges from 9 to about 500 ppm, depending on the location of the growing plant in relation to the source of this effluent.

Lack of rainfall appears to accentuate injury. In one case in the state of Washington, the fluorine content of prune leaves was found to be 83 ppm in two adjacent orchards. However, injury was significantly less in the orchard which had an overhead sprinkler irrigation system.

There is a great variation in the susceptiblity of various species to injury. Gladiolus is at present considered to be the most susceptible plant of all observed. There is a variation in the the degree of injury in varieties growing side by side. Conifers such as pine and fir are very sensitive to injury. Willow, birch, sweet cherry, nut, plum, potato and grape have also been found to be very sensitive to injury when subjected to 10 ppm of hydrogen fluoride under test fumigations in special chambers. Elm, poplar, pear, oak, locust, and alder appear to be quite resistant to injury. Under field conditions some of these trees showed more injury with lower fluorine content than when tested in a fumigation chamber.

Summary

It is known that sulphur dioxide is always present in foundry cupola gas effluents. If the coal or coke is not properly combusted sulphur dioxide may be produced in such concentrations as to cause acute or chronic injury to plants in the vicinity under conditions of intense daylight, high humidity, and high temperature, especally when there is a slow movement of the air.

Fluorine compounds will escape as effluents when fluorspar and cryolite are used as fluxing materials. Fluorine gases accumulate in the tissues of the leaves and cause severe injury especially during dry periods. These and other toxic gases when present in sufficient concentrations in the atmosphere surrounding growing plants cause reduction in growth, kill the leaves outright, and may lead to the death of affected plants. Dusts may cause clogging of the leaf pores, preventing normal air exchange, or cover the leaf surfaces to such an extent as to reduce photosynthetic activity.

In the following bibliography only some of the more recent papers are given. From these references and from references in *Chemical Abstracts* all except the legal literature on the subject can be found.

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ADD TWO STUDENT CHAPTERS TO SOCIETY'S GROWING ENGINEERING SCHOOL MEMBERSHIP

INSTALLATION of two student chapters within a week gives the American Foundrymen's Society ten student groups in some of the country's leading engineering schools. University of Alabama students saw the culmination of two year's planning when the ninth student chapter was installed February 22. Newest student group was installed at the Technological Institute of Northwestern University February 28.

The Alabama student chapter was approved a year ago and was installed as a prelude to this year's 19th Annual Regional Foundry Conference of the Birmingham District Chapter held February 22-24. Principal speaker was National President Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, who cited the significance of the foundry industry, pointing to its basic role in peace and defense. In outlining the place of the young engineer in the production of metal castings, he referred to the improvement in melting facilities in a plant which almost 40 years ago produced malleable iron in 20-ton-a-day air furnaces. Today the same foundry produces 40 tons an hour with each of its cupola-air furnace units.

Foundry Needs Technical Men

Technical men were required to make the transition, Mr. Woody said, and they will continue to be required as improvements are made in plant layout, mechanization, metal handling, molding and coremaking, and all other phases of foundry production and quality control.

Official installation occurred when A.F.S. Secretary-Treasurer Wm. W. Maloney passed the cast iron rattle symbolic of the Society's baby chapter to Anthony J. McAndrews, student chairman. On behalf of the Society, Mr. Maloney presented the new chapter a complete foundry technical library of publications issued by A.F.S. McAndrews presided at the meeting.

Other speakers who welcomed the new student group into the Society were: National Director T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; J. T. MacKenzie, American Cast Iron Pipe Co., nominee for national director; Morris L. Hawkins, Stockham Valves & Fittings, chairman of the Birmingham District Chapter; Herbert F. Scobie, editor, AMERICAN FOUNDRYMAN; and R. L. Lee, General Motors Corp., Detroit.

Representing the University of Alabama administration were Professor Herbert Kuenzel of the mechanical engineering department and Professor George Johnson of industrial engineering. L. N. Shannon, Stockham Valves & Fittings, past national president of the Society, is industrial adviser to the student chapter. Faculty adviser is Professor Warren C. Jeffery.

Members of the University of Alabama Student Chapter, in addition to Chairman McAndrews, are: Dwight E. McGill, *vice-chairman;* Thomas J. Price, *secretary-treasurer;* and Arnold Abrams, Charles A. Beede, Robert L. Bronnes, Theodore B. Brydges, A. E. Fitzgerald, Jackson H. Gibbs, Lewis C. Gibson, Aaron S. Glidewell, John H. Goodman, Joseph C. Graden, E. Paul Hjorth, Sidney G. Holder, Jr., Herbert H. Jaeger, Robert E. Jennings, Eugene E. Langner, Jr., Roland L. LeVaughn, James M. Morgan, Muammer Ahmet Oztekin, George Pallas, Charles R. Pandelis, Richard E. Ray, Carlos J. Romero, and Martin Schmutz.

Photographer at the Alabama installation was Wm. W. McCulloch, American Cast Iron Pipe Co., Birmingham, Ala.

Northwestern Is Baby Chapter

Participating in the Northwestern University Student Chapter installation were students and faculty members from the school's Technological Institute, members of the Chicago Chapter, and A.F.S. National Office representatives. (Full story and pictures will appear in April.)

Industrial adviser to the tenth student chapter is Past National Director Bruce L. Simpson, National Engineering Co., Chicago. Faculty advisers are Professor Donald H. Whitmore and Willis T. Chandler. Officers are: *chairman,* A. Putnam Volkmar; *vice chairman,* Joseph Alber; and *sec.-treas.,* Robert Ball.

Part of group of students and foundrymen at University of Alabama Student Chapter installation watch A.F.S. Secretary-Treasurer Wm. W. Maloney (right, center) give Student Chapter Chairman McAndrews left-handed grip as he passes carefully wrapped cast iron rattle. Seated is National President Woody.

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WESTERN MICHIGAN CHAPTER

Robert O. Blackford, Sales Repr., Clipper Abrasive Products, Grand Rapids, Mich.
George H. Eddy, Stock Room & Rec. Supv., Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Hugh P. Gibbsons, Met., Standard Foundry, Inc., Cadillac, Mich.
James C. Jacobs, Layout Man, Lakey Foundry & Mach. Co., Muskegon, Michigan.
Anthony L. Steiner, Heat Treat Supv., Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Carleton J. Veitenheimer, Layout, Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.

WESTERN NEW YORK

Sherman Buller Burke, Dist. Sales Mgr., Hanna Furnace Corp., Buffalo.
William C. Glenn, Salesman, National Grinding Wheel Sales Co., Buffalo.
Francis J. McCarthy, Sales Repr., Swan-Finch Oil Corp., Buffalo.
Carl F. Renz, Appr. Foundryman, Worthington Pump & Mach. Co., Buffalo.
Great Lake Carbon Corp., Niagara Falls, N. Y. Samuel H. Reynolds, Sales Mgr., Electrode Div.

WISCONSIN CHAPTER

John J. Cannon, Iron Molder Appr., Allis Chalmers Mfg. Co., Milwaukee.
Edward Duras, Mold Fmn., Grede Foundries, Inc., Milwaukee.
Edward C. Froemming, Supt., Motor Castings Co., West Allis, Wis.
H. H. Kitzrow, Purchasing Agent, Grede Foundries, Inc., Milwaukee.
Vincent Mikelonis, Chemist, Grede Foundries, Inc., Milwaukee.
Aaron G. Ott, Sales Repr., Carborundum Co., Milwaukee.
George R. Stein, Student, Met., University of Wisconsin, Madison, Wis.
Bernard W. Straus, Buyer, Grede Foundries, Inc., Milwaukee.
Edmund Wiczynski, Night Fmn., Zenith Foundry Co., Milwaukee.

STUDENT CHAPTERS

MICHIGAN STATE COLLEGE

Dean F. Maurer — William E. Kamradt — William H. Row

NORTHWESTERN UNIVERSITY

Robert J. Ball — James L. Calhoun, IV — Edward Jos. Campbell
Louis D. Davis — Milton R. Johnson — Edward R. Wood

OREGON STATE COLLEGE

Herbert J. Allen — Lawrence J. D'Assisi

TEXAS A. & M.

William C. Moses

UNIVERSITY OF ALABAMA

Jackson H. Gibbs — Muammer A. Oztekin — Charles R. Pandelis

UNIVERSITY OF MINNESOTA

Denis O. Bakke — William A. Koppi

OUTSIDE OF CHAPTER

Hector J. Chamberland, Field Research Engr., DoAll Company, Springfield, Mass.
R. E. Dobbin, Godfrey L. Cabot, Inc., Boston.
Joseph Martinek, Student, Bullard-Havens Tech. School, Bridgeport, Conn.
George F. Nadeau, Jr., Student, Bullard-Havens Tech. School, Bridgeport, Conn.

Illinois Tech Becomes Thirteenth School On FEF Scholarship Program

WITH AN INITIAL GRANT of $2,500, Illinois Institute of Technology, Chicago, recently became the 13th engineering college to participate in the Foundry Educational Foundation's scholarship program. The grant will provide partial scholarships for upper-class metallurgical engineering students.

Illinois Tech was selected by the Foundation because of its service to the foundry industry in the Chicago area, it was announced by George K. Dreher, executive director of the Foundation.

URGE PLANNED SAFETY PROGRAMS AT A.F.S. CHICAGO CHAPTER MEET

Irving H. Dennen
Advertising Manager
Beardsley & Piper Div., Pettibone Mulliken Corp.
Chicago

IMPROVED FOUNDRY SAFETY was the keynote of Chicago Chapter's February 12 evening Lecture Course meeting, held at the Peoples' Gas Building Auditorium and featuring a talk on *"Single Objective Approach to Safety,"* by D. A. Farrell, supervisor of safety, United States Steel Corp., Pittsburgh, and a panel discussion by prominent Chicago area safety and personnel relations experts.

Opening the meeting, Prof. Roy W. Schroeder, University of Illinois, Navy Pier Branch, Chicago, introduced William A. Davis, senior engineer, Industrial Dept., National Safety Council, technical chairman for the meeting. Mr. Davis cited the vital importance of a well-rounded safety program.

Mr. Farrell, principal speaker of the evening, in describing his company's "single objective" safety program, said that U. S. Steel management has always regarded the safety of its employees as the most important single factor in its operation.

Mr. Farrell went on to describe the "Awareness Chart" that is a vital part of his company's safety program. One of these charts is made out by the foreman or supervisor for every plant accident, whether or not it involves lost time. On the chart are listed location of the accident, part of the body injured and the act believed to have caused the accident.

Periodically, all of these charts for each department are compiled into a single departmental chart. When accidents occur repeatedly in a certain operation or location, or when the same worker violations of good safety practices result in accidents time after time, immediate action is taken to overcome these hazards.

Industry can reduce its accident rate, Mr. Farrell concluded, by instilling the "Three C's" into every employee—"Comprehension, Contact and Control."

Following Mr. Farrell's talk, Meeting Technical Chairman Davis introduced members of a five-man panel on *"Improved Foundry Safety,"* composed of Mr. Farrell; Walter Voight, supervisor of safety, McCormick Works, International Harvester Co., Chicago; Walter McNeely, safety supervisor, Continental Foundry & Machine Co., East Chicago, Ind.; Leonard Cole, safety engineer, Crane Co., Chicago; and Charles Alexander, National Safety Council, Chicago.

Among interesting safety facts brought out during questioning of panel members by the audience were: the number of scrapped castings in a foundry are in direct ratio to the number of industrial accidents; most prevalent foundry accidents occur in hooking, chipping and maintenance work and because of inexperience on the part of laborers; wearing of safety equipment by workers can be encouraged by letting them know each instance wherein use of protective clothing or equipment has prevented a serious accident, or conversely, when failure to wear or use safety equipment provided has resulted in a lost-time accident; and that 99 per cent of all industrial accidents do not involve lost-time, but are an indication of serious accidents that could possibly follow.

Left: answering questions from the floor at Chicago Chapter's safety meeting were these safety expert's, starting left: Walter McNeely, Continental Foundry & Machine Co., East Chicago, Ind.; Charles Alexander, National Safety Council, Chicago; Walter Voight, International Harvester Co., Chicago; Leonard Cole, Crane Co., Chicago; and Dan Farrell, United States Steel Corporation, Pittsburgh, principal speaker of the evening. Right: A.F.S. National Secretary-Treasurer Wm. W. Maloney, left, congratulates speaker Dan Farrell on his talk as Chapter Chairman C. V. Nass, Pettibone Mulliken Corporations, looks on.

Letters to the Editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Foundry or Armed Forces?

During the past few weeks, a picture of a man 56 years old appeared in the newspapers and magazines. He is standing beside a melting furnace with the molten metal running from the spout into a ladle. Beneath this picture the caption reads "A grandfather has been inducted into the U. S. Navy for the third time, in 1917, 1942, and again in 1950." The article goes on to say that he passed his physical examination with flying colors.

This is quite an honor and record and he is to be highly commended for his patriotism and service to our country, but this picture makes one wonder whether or not his foundry job wasn't more important to the defense effort than the one he has in the Navy. Also, whether the powers-that-be are looking ahead and giving attention to the great importance of foundry workers to the defense effort. Are those in charge of drafting manpower going to find themselves in the same predicament as during World War II, when foundry workers were drafted promiscuously and other tradesmen were exempted?

A shortage of castings can cause dire results and as one who served in the Navy during World War I, it is my opinion that the war effort would be helped far more if men of 56, enjoying good health, were left in the foundry industry. Let the younger fellows with no foundry experience carry on the traditions of John Paul Jones.

Earl M. Strick, *Finishing Supt.*
Erie Malleable Iron Co.
Erie, Pa.

Statistical Quality Control

In *"Statistical Quality Control Manages Foundry Operations"* (American Foundryman, January 1951, p. 40), Robert J. Feltrin states: "It is stressed that the success of the system was largely dependent upon the speed with which the tests could be made, the data gathered, and plotted." Elsewhere in the paper he remarks on action which was taken when a chart indicated the system was out of control. It should be emphasized that a quality control system can result in a set of impressive charts and be worthless unless action is taken immediately when indicated.

Mr. Feltrin gives as evidence of "out of control" the points outside the 3-sigma limits and sets of points grouped in some narrow band within the allowed limits. The importance of the latter phenomenon is too often overlooked in discussion of quality control systems. In most foundry operations there is a third indication of "out of control," namely, a series of points which have an upward or downward trend. Unless prompt and correct action is taken to disrupt such a trend, serious trouble can result.

"Out of control" merely means that a change has been made in the operation so that tests on the product of the operation yield data which do not belong to the same universe as previous data. In a majority of cases the accidental change may be bad and so we resort to trouble shooting and elimination or correction of the change. The men in the foundry—and sometimes the quality control men—get to regard "out of control" as something reprehensible. It is not always so.

It is possible that the system could go out of control and produce a desirable change in the product. Here the tendency would be to let well enough alone. A better scheme would be to recognize that sometimes "out of control" is a favorable condition. Investigations of the cause of the "out of control" condition should be made and the cause incorporated as part of the standard procedure and new charts constructed.

W. K. Bock, *Res. Eng.*
National Malleable & Steel Cstgs. Co.
Cleveland

The first three points of Mr. Bock's commentary are very important to such a control system. Regarding the fourth point, I should like to add that 85 per cent of the castings produced by the foundry described were made to specifications of the various engineering and technical organizations. Since the control limits were kept as much as possible coincident with specifications, variations outside the limits, through choice, had to be regarded as reprehensible. This, however, did not hold true for the specialty lines of the foundry.

Robert J. Feltrin
Ottawa, Ont., Canada

Galvanizing of Iron

Referring to Robert Sandelin's paper on galvanizing characteristics of gray and malleable iron in the December 1950 issue of American Foundryman (p. 64), it would appear that one important variable having to do with galvanized coatings has been omitted. This is the aluminum content of the spelter used, since percentages of as little as 0.05 per cent aluminum would probably have as much effect on coating thickness and weight loss as the variable in the base metal being galvanized.

It would be interesting to know whether the dross-forming characteristics, also the appearance and weight of coating were investigated with aluminum-containing spelters.

Gordon W. Johnson, *Supv.*
Foundry Process Research
Armour Research Foundation
Chicago

It is true that an appreciable aluminum content, of say over 0.050 per cent, would affect the characteristics of the coatings. However, under the conditions of the work reported, all test samples were treated simultaneously on the same rack (three together) and in the same spelter bath. Accordingly, whatever the aluminum content of the spelter bath might be, the test samples reveal their characteristic coating variations under a controlled condition.

Spectrographic determinations of the aluminum content of the spelter baths where this work was done show the aluminum content to be less than 0.010 per cent. The aluminum content of the spelter was determined by gravimetric methods to be under 0.030 per cent since the spectrographic analysis was not readily available at the time the work was done. It was concluded that the spelter was essentially free from aluminum insofar as specific effects of the aluminum were concerned.

I agree that it would be interesting to know the general galvanizing characteristics of the various materials in aluminum-containing spelter.

Robert W. Sandelin, *Chief Met.*
Connors Steel Co.
Birmingham, Ala.

Calcium Nodular Irons

Prof. De Sy, in his latest article (*"Eliminate Second Inoculation in New Nodular Iron Process,"* American Foundryman, February 1951, p. 41) is most stimulating and thought-provoking as usual. The calcium nodular irons and the calcium alloys used are very interesting. We have produced calcium nodular irons of similar structure and properties but usually with metallic calcium or with the less-expensive calcium-silicon alloy. Prof. De Sy's alloys will afford a more positive method of incorporating calcium into the iron in the ladle. The least expensive calcium alloy is calcium carbide, and we have produced nodular irons by simply melting and superheating iron of suitable composition in contact with calcium carbide. This has also been reported by H. Morrogh.

With regard to the amount of calcium in the iron required to produce nodular iron, our best determinations by wet chemistry and by wet spectroscopic methods give values in the order of 0.01 per cent. Calcium nodular irons have analyzed from 0.006 to 0.015 per cent calcium. It seems that the primary requisite for producing nodular irons with desulphurizing elements such as calcium, magnesium, cerium, lithium, etc., is to positively eliminate FeS, and especially all MnS. Fulfilment of this condition apparently requires a very slight excess of Ca and a somewhat larger excess of Mg or Ce.

Regarding the elimination of the second inoculation by use of Prof. De Sy's nodul-

(Continued on Page 89)

WHO'S WHO

B. F. Kline, co-author with J. R. Davidson of *"Manufacture of Bronze Boiler Drop Plugs,"* on Page 34, is chief chemist for Southern Pacific Railroad, Sacramento, Calif. . . . Graduating from the University of California, Berkeley, in 1913, with a B. S. in Electrical Engineering, he has been with Southern Pacific since and is a registered professional engineer in chemical engineering . . . Mr. Kline is a member of American Society for Testing Materials, American Chemical Society, American Society for Metals and the National Society of Professional Engineers.


B. F. Kline

J. R. Davidson, co-author with B. F. Kline of *"Manufacture of Bronze Boiler Drop Plugs,"* Page 34, is supervisor of foundry operations, Southern Pacific Railroad Sacramento, Calif. . . . Holder of a B. S. in chemical engineering from the University of British Columbia in 1923, Mr. Davidson, like his co-author, has spent his entire professional career with Southern Pacific, serving successively as chemist, wheel inspector, metallurgist and, since 1941, as supervisor of foundry operations. He is a member of A.F.S. and is a registered professional chemical engineer, state of California.


J. R. Davidson

E. J. Jory, author of *"Core Practice as Related to Malleable Foundry Losses,"* Page 44, is foundry engineer, Chicago Works, National Malleable & Steel Castings Co. . . . Starting his foundry career as an apprentice with Oilwell Supply Co., Oil City, Pa., in 1934, Mr. Jory later attended Case Institute of Technology, graduating in 1940 with a degree in metallurgical engineering . . . Following graduation, Mr. Jory was employed for five years at National Malleable's Sharon, Pa., Works, as sand technician and later core room foreman . . . After two years as molding foreman at Eastern Malleable Iron Co., Mr. Jory rejoined National Malleable in his present capacity as foundry engineer.


E. J. Jory

Kennard F. Lange, co-author with Russell J. Geitman of *"Modern Foundry Methods — Mechanizing the Small Foundry,"* Page 40, is sales manager of the Pershing Road Plant, Link-Belt Co., Chicago . . . Holder of an M. E. from Purdue University (1930), Mr. Lange began his business career in the cost department of Link-Belt's Dodge Plant, Indianapolis, in 1923, resigning from full-time work to enter Purdue but continuing as a summer worker with Link-Belt. Rejoining Link-Belt in 1930 on a full-time basis at the company's Ewart Plant, Indianapolis, he was later transferred to the Pershing Road Plant sales department, Chicago, where he has been sales manager since 1948.


K. F. Lange

Russell J. Geitman, co-author with Kennard F. Lange of *"Modern Foundry Methods — Mechanizing the Small Foundry,"* Page 40, is sales engineer of Link-Belt Co.'s foundry and steel mill equipment division, Chicago . . . A graduate of Armour Institute (mechanical engineering) in 1928, he started his business career that same year as a draftsman with Link-Belt's Caldwell Plant, Chicago . . . He subsequently served in various engineering capacities with Link-Belt sales offices in Cleveland, St. Louis and Chicago, and was appointed his present position in 1948 . . . Mr. Geitman is a registered professional engineer, state of Ohio, and is a member of A.F.S., ASME, and the American Institute of Steel Engineers.


R. J. Geitman

Aluminum Data Book Available Gratis

ALUMINUM DATA BOOK, a 194-page pocket-size manual, available free-of-charge from Reynolds Metals Co., Louisville, Ky., contains information on aluminum alloys, tempers, sizes, shapes, physical, chemical and mechanical properties and fabricating characteristics. Text contains 117 tables on properties, tolerances, weights, standard sizes and production limits, relative corrosion resistance, chemical reactions, elevated and low temperature properties, fatigue strengths and many others.

Copies of *Aluminum Data Book* are available without charge to foundrymen, engineers, etc., writing directly to Reynolds Metals Co., 2500 S. Third St., Louisville, Ky., on company letterhead.

BOOK REVIEWS

Nomogram Index

An Index of Nomograms, by Douglas Payne Adams, associate professor of Graphics, Massachusetts Institute of Technology, 174 pp. Published jointly by the Technology Press of Massachusetts Institute of Technology and John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $4.00. (1950).

Containing more than 1700 nomograms published in well-known periodicals, this index serves as an invaluable time saver in the repeated solution of mathematical formulae. The Index is divided into two parts: (1) Key Words, and (2) Master Index. The first contains an alphabetical list of key words associated with each of the diagrams. Following each entry is a key number reference to the master index, where the periodical, date of issue, volume, number and page number of the nomogram are listed. Also given in a bracket following the title are the variables employed in each diagram.

Welding Handbook

Welding Handbook, Third Edition. 1650 pp., clothbound, illustrated, indexed. Published by the American Welding Society, 33 West 39th St., New York 18, N. Y. $12.00 in U.S. and Canada. $13.00 elsewhere. (1950).

This complete and authoritative volume contains 65 chapters covering more than 30 welding and cutting processes for nonferrous and ferrous metals and alloys. Included are chapters on cost estimating, welding metallurgy, physics of welding, a dictionary of welding terms, general engineering tables, welding symbols, filler metal specifications, inspection and many others. More than 300 tables are included for ready reference and details of welding processes, equipment and applications are illustrated. Extensively cross-referenced 69-page index is grouped by welding processes, metals and applications and under such engineering headings as design, workmanship, inspection, etc. Each item is also separately listed alphabetically.

FOUNDRY Personalities

Arthur T. Dalton, secretary, Chicago Wheel & Manufacturing Co., Chicago, has been appointed to the Advisory Committee, Abrasive Industry, National Pro-

A. T. Dalton

duction Authority. During World War II, Mr. Dalton was a member of the Abrasive Advisory Group, War Production Board.

Oscar S. Straus, treasurer of the American Smelting & Refining Co., New York, was elected a director of the company at a recent meeting of its Board of Directors. Mr. Straus is a director of Revere Copper & Brass, Inc., General Cable Corp., and a number of civic and charitable organizations. A former State Department official and a Coast Guard veteran of World War II, he has been treasurer of ASARCO since 1949.

Benjamin E. Feeley, formerly industrial engineer and methods analyst with Frederick L. Harrison, New Orleans and Los Angeles, has been appointed production control manager for Hunt-Spiller Mfg. Corp., Boston, succeeding R. G. Fredette.

Edmund Fitzgerald, president of Northwestern Mutual Life Insurance Co., Milwaukee, was recently elected a member of the Board of Directors of Allis-Chalmers Mfg. Co. Simultaneously, it was announced that **Louis Quarles**, a director and general counsel of the company since 1941, has been elected chairman of the executive committee.

Chris. A. Zanison, formerly foundry superintendent for Warren Alloy & Machine Co., has been named foundry superintendent for City Pattern Foundry & Machine Co., Detroit. A graduate of West Virginia University, Mr. Zanison served as an Army officer in World War II.

Victor F. Stine and **Lloyd L. Stouffer** have been elected directors of Pangborn Corp., Hagerstown, Md. In addition, Mr. Stine will assume the duties of vice-presi-

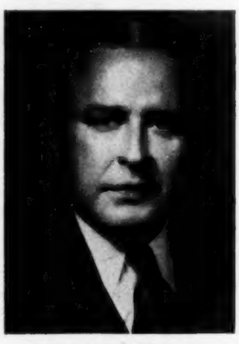
V. F. Stine

dent in charge of sales and engineering and Mr. Stouffer becomes secretary-treasurer and takes charge of production. Mr. Stine has been with Pangborn 38 years, starting as a clerk and in 1935 becoming vice-president in charge of sales. His newly-added vice-presidential responsibilities now embrace engineering activities. Mr.

L. L. Stouffer

Stouffer has been with Pangborn for 32 years and has been secretary and assistant-treasurer since 1940. Simultaneously, it was announced that Executive Vice-President **P. J. Potter** is retiring from his more active duties but will continue to serve Pangborn as a director and vice-president. He will also act as a consultant and will look after special assignments.

Harold G. Lolley, formerly iron foundry superintendent, Bucyrus Erie Co., Erie, Pa., has been named foundry superintendent for Rosedale Foundry & Machine Co.,



H. G. Lolley

Pittsburgh. Mr. Lolley has served for the past three years as a director of the A.F.S. Northwestern Pennsylvania Chapter and as chairman of the Chapter's Entertainment Committee.

W. H. Johnson, has been named executive vice-president and **W. R. Bond**, general manager of Lone Star Steel Co., Dallas, Texas. Both men are members of the company's Board of Directors.

Richard T. Barnes, Jr., has been named West Coast representative for Tumb-L-Matic, Inc., New York, and will operate out of San Francisco.

Barry H. Fisher has been named Baltimore sales representative for United States Graphite Co., Saginaw, Mich. A native of England, Mr. Fisher served as a captain in the Royal Air Force during World War II, joining U. S. Graphite a year ago. He is a graduate of the Tonbridge and Polytechnic Schools, London. Mr. Fisher's territory will comprise southeastern Pennsylvania, eastern West Virginia and North Carolina, major portions of Maryland and Delaware and all of the District of Columbia territory.

David White has been named president of Lester Engineering Co., Cleveland, designers of injection molding and die-casting machines. A former dentist, Mr. White joined Lester Engineering in 1940, becoming vice-president in charge of coordinating executive activities. **David Sloane** has been named vice-president in charge of engineering and development.

Bruce W. Gonser has been named assistant director of Battelle Memorial Institute, Columbus, Ohio, and will guide development of Battelle's program in hitherto unexplored fields of metallurgy and chemistry of metals. He will also continue to direct non-ferrous metallurgical research. Associated with metallurgical research for 27 years, Dr. Gonser joined Battelle in 1934 as supervisor of research in non-ferrous metallurgy and since that time has developed several practical techniques for forming pure metals and metallic coatings.

B. W. Gonser

C. H. Wills, sales manager for the Michigan Abrasive Co., has been named director of sales. He will be succeded as sales manager by **Barnard S. Meade,** formerly vice-president and general manager of American File and Swiss Tool Co., Newark, N. J.

Oscar L. Olson, general manager, Plastics Division, has been named to succeed his father, the late Nels L. Olson, as president and general manager of the Swedish Crucible Steel Co., Detroit. Oscar Olson, after attending the University of Miami, started with Swedish Crucible's foundry in 1936 as assistant chemist, subsequently becoming salesman, sales manager, and Plastics Division manager.

O. L. Olson

(Continued on Page 92)

A. F. S. CHAPTER DIRECTORY

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TEXAS CHAPTER *Secretary,* John M. Morris, Lone Star Steel Co., P. O. Box 8087, Dallas 5, Texas.

TIMBERLINE CHAPTER *Secretary,* James Schmuck, Rotary Steel Castings Co., 1425—5th St., Denver, Colorado.

TOLEDO CHAPTER *Secretary-Treasurer,* R. C. Van Hellen, Unitcast Corp., 1414 E. Broadway, Toledo, Ohio.

TRI-STATE CHAPTER *Secretary,* C. C. Beagle, Webb Corp., Box 549, Webb City, Mo.

TWIN-CITY CHAPTER *Secretary-Treasurer,* Lillian K. Polzin, Minneapolis Chamber of Commerce, 1750 Hennepin at Groveland Terrace, Minneapolis.

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WESTERN NEW YORK CHAPTER *Secretary,* R. E. Walsh, Hickman, Williams & Co., 32 Eastwood Place, Buffalo, N. Y.

WISCONSIN CHAPTER *Secretary,* J. G. Risney, Risney Foundry Equip. Co., 1307 N. 63rd St., Milwaukee 13.

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UNIVERSITY OF MINNESOTA *Secretary-Treasurer,* Gerald A. Sporre

MISSOURI SCHOOL OF MINES *Secretary,* Joe L. March

OHIO STATE UNIVERSITY *Secretary-Treasurer,* Edward H. Losely

OREGON STATE COLLEGE *Secretary,* Leonard M. Preston

TEXAS A & M COLLEGE *Secretary,* R. L. Jones

UNIVERSITY OF ALABAMA *Secretary,* Robert J. Price

NORTHWESTERN UNIVERSITY *Secretary-Treasurer,* Robert Ball

A few of the chapter officials and members who attended A.F.S. Mexico City Chapter's January 17 meeting.

CHAPTER ACTIVITIES NEWS

Central Indiana

Paul V. Faulk
Electric Steel Castings Co.
Chapter Reporter

SOME 87 MEMBERS and guests attended the January 8 meeting to hear R. L. McIlvaine, National Engineering Co., Chicago, discuss *"What to Look for When Buying a Mechanized System, and How to Get the Most Out of It."*

The primary purpose of a mechanized system, said Mr. McIlvaine, is to get more good castings per molding station. To accomplish this, Mr. McIlvaine recommended that the foundryman look for (1) a system that delivers uniform sand to stations, (2) adequate storage to meet peak demands, (3) some method of cooling sand before it reaches bin, and (4) removal of sand from belt by apportioning method. A system like this, he concluded, must function properly at all times and to accomplish this, it must be serviced properly and regularly.

Mexico City

N. S. Covacevich
La Consolidada, S. A.
Chapter Secretary

JANUARY 17 MEETING, held in a Mexico City restaurant, featured a technical talk by Francisco Diaz Covarrubias on *"Classification of Iron-Carbon Alloys,"* in terms understandable to the practical foundryman.

Following Mr. Covarrubia's talk, Chapter Secretary N. S. Covacevich read out a 21-question foundry examination developed by Whiting Corp. Despite the apparent simplicity of the questions, they were frequently difficult, but chapter members on the whole achieved high scores.

CHAPTER MEMBERSHIP CHAIRMEN

HAVE YOU ACHIEVED YOUR MEMBERSHIP "TARGET" FOR THE FISCAL YEAR 1950-51?

SEE PAGE 33

Vice-Chairman Dan Mitchell, Progressive Brass Mfg. Co., Tulsa, left, looks on as speaker Chris A. Zanison, City Pattern Foundry & Machine Co., Detroit, displays shell molds used to point up his talk at the January 12 meeting of Tri-State Chapter, Tulsa, Okla.

Quad City

Elmer C. Zirzow
Deere & Co.
Chapter Reporter

JANUARY 15 MEETING began with a coffee talk by H. Bornstein, Deere & Co., Moline, Ill., on his experiences and impressions of his recent trip abroad, particularly the British Isles. There was plenty to eat, Mr. Bornstein said—if you were not particular what you ate. The European workman, he added, doesn't own an automobile because of their excessive cost and scarcity. Bicycles are the most common means of transportation to and from work. Mr. Bornstein visited the British Cast Iron Research Association and was impressed with the fine work being done by that organization. In conclusion, Mr. Bornstein described impressions gathered by British foundry productivity teams of U. S. foundry methods.

Ray A. Witschey, A. P. Green Fire Brick Co., speaking on *"Refractories,"* stated that foundry refractories cover a wide variety of applications and it would be impossible to discuss them in detail. He then spoke briefly on commonly-used refractories and stated that the average foundryman finds it difficult to classify such common refractories as (1) Acid (composed pri-

marily of SiO_2); (2) Basic (CaO; MgO; Al_2O_3); and (3) Neutral (C or Cr).

There are a great variety of these various types of refractories available, Mr. Witschey said, and in addition, these types are available in a variety of forms such as tiles, bricks and special products, and the speaker advised buying by basic composition and not by brand names.

Fireclay or refractory products made from fireclay constitute 70 per cent of all refractories, Mr. Witschey said. These are made either by hand, dry press or of stiff mud, are then dehumidified, dried burned and fired. They are then tested for (1) fusion point or pyrometric cone, (2) resistance to thermal spalling, (3) bulk, (4) porosity, (5) thermal conductivity, and (6) other tests.

The speaker advocated purchase of standard forms for reasons of economy and availability. Plastic refractories, he added, are finding more and more applications, as are mortars.

Concluding his talk, which was illustrated with slides showing manufacturing processes and applications of refractories in the foundry, Mr. Witschey urged foundries to investigate new refractories that will result in appreciable foundry economies.

Chicago

I. H. Dennen
Beardsley & Piper Div., Pettibone Mulliken Corp.
Chapter Reporter

ALMOST 200 Chicago foundrymen attended the January 9 meeting, which featured group discussions on steel, gray iron, malleable iron, non-ferrous and pattern problems.

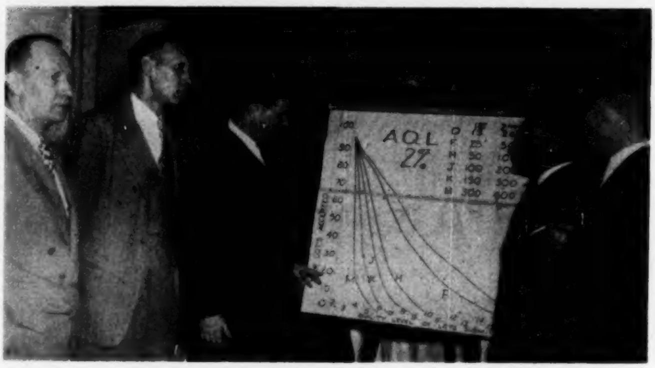
Members of the Chapter separated into their respective groups after dinner. The Steel and Pattern Group, under the chairmanship of Clyde Wyman, Burnside Steel Foundry Co.,

The fair sex shared Cincinnati District Chapter's December 16 Christmas Party, held at the Netherlands Plaza Hotel, Cincinnati. More than 500 persons enjoyed dinner, dancing and a five-act program of vaudeville.

Snapped at Central Indiana Chapter's January 8 meeting were, left to right, Vice-Chairman Robert Spurgin, III, Swayne-Robinson Co., Richmond; speaker R. L. McIlvaine, National Engineering Co., Chicago; and technical chairman B. E. Gavin, National Malleable & Steel Castings Co.

Chapter and National officers attending Central Indiana Chapter's February 5 meeting were, left to right: Chairman Allen J. Reid, General Refractories Co.; A.F.S. National Director Martin J. O'Brien, Jr., Symington-Gould Corp., Depew, N. Y.; A.F.S. National Secretary-Treasurer Wm. W. Maloney; Past Chairman Richard Bancroft, Perfect Circle Corp.; and Past Chairman I. R. Wagner, Electric Steel Castings Co., 1951-52 A.F.S. Vice-Presidential Nominee. (Photo: Henry Yeager, International Harvester Co.)

Speakers at Western New York Chapter's February 2 meeting were, left to right, Lieutenants William C. Hart and Thomas M. Brown, Erie Railroad Police, shown with Vice-Chairman Erwin Deutschlander, Worthington Pump & Machinery Corp., and Secy. Roger Walsh, Hickman, Williams & Co.



Holding a post-meeting discussion at Detroit Chapter's January meeting were, left to right: George F. Bluth, Willys-Overland Motors; Robert Schenck, Aluminum Co. of America; Nelson G. Meaghley, Willys-Overland Motors; J. E. Rainey and Lew Harkness of Detroit Testing Laboratories.

Lucky winner of an automatic toaster at Oregon Chapter's raffle for the benefit of the A.F.S. Housing Fund was Stanley H. Kukowski of Electric Steel Foundry Co., Portland, who is standing at right of Chairman James C. Brodigan, Columbia Steel Casting Co., and Vice-Chairman E. J. Hyche, Rich Mfg. Co. (Photo courtesy Norman Hall, Electric Steel Foundry Co.)

heard A. S. Grot speak on "*Standardization of Casting Practice.*" Mr. Grot is with Edward Valves, Inc., East Chicago, Ind.

The Gray Iron Group, under the chairmanship of Carl Blum, Lundgren Foundry Co., heard a talk on "*Cores for the Jobbing Foundry.*" The speaker was Oscar Blohm, Curto Ligonier Foundry Co., Ligonier, Ind.

The Malleable Group held another of its popular "*Clinics for Foundry Headaches.*" The group, under the chairmanship of Del Sherman, International Harvester Co., limited its discussion to "*Headaches in the Foundry and Core Department of the Malleable Foundry.*"

The Non-Ferrous Group met with Chairman Fred Riddel, H. Kramer and Co. and heard speaker W. C. Shirley, U. S. Reduction Co., East Chicago, Ind., discuss technical aspects of "*Melting Vehicles and Materials for Aluminum Alloys.*"

Tri-State

F. E. Fogg
Acme Foundry & Machine Co.
Chapter Chairman

JANUARY 12 MEETING featured a talk by Chris A. Zanison, City Pattern Foundry & Machine Co., Detroit on the "*Shell Molding Process.*"

Mr. Zanison illustrated his talk by showing shell molds and typical castings made from them and, following his talk, answered many questions about the process.

A.F.S. National Director L. C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill., met with the Chapter's Board of Directors prior to the regular meeting and later discussed the A.F.S. Building Fund with the 50 chapter members present.

Mo-Kan

Thomas F. Shadwick
Witte Engine Works
Chapter Reporter

FIVE NEW MEMBERS were welcomed by the Chapter at its January 10 meeting: Bramwell Case, American Brake Shoe Co., North Kansas City, Mo.; Everett Armstrong and William Blatt of Fairfax Foundry, Kansas City, Kansas; Clement A. Trapp, Locomotive Finished Material Foundry & Machine Co., Atchison, Kansas; and R. E. Normandy, Standard Brass Foundry & Manufacturing Co.

Herman Schwickrath, Prior Brass Mfg. Co., Chapter Treasurer, reported that the Chapter has contributed $300 to the A.F.S. Building Fund.

Evening's speaker was Chris Zanison, City Pattern Foundry & Machine Co., Detroit, whose subject was "*Shell Molds Invade the Foundry.*"

Mr. Zanison described advantages

(Continued on Page 72)

of this process in making large quantities of quality brass and bronze castings. He explained that the molds are thin and porous, releasing gases freely, yet castings are so smooth as to need little or no cleaning.

The process, he added, casts to very close tolerance, produces more molds per hour than regular sand casting, saves floor space, expensive machinery and high labor costs.

Mr. Zanison explained the composition of shell molds and showed slides of production-basis shell molding at City Pattern Foundry & Machine Co. He then passed around pieces of finished molds.

Oregon Chapter's January meeting speaker was Russell J. Geitman, Link-Belt Co., Chicago, who described ways of "Mechanizing a Small Foundry." (Photo courtesy Norman Hall of Electric Steel Foundry Company, Portland, Ore.)

In the question-and-answer period following Mr. Zanison's talk, the speaker said shell molding experiments now under way will eventually lead to making of molds for large gray iron and steel castings.

FUTURE CHAPTER MEETINGS

• MARCH 16

BIRMINGHAM DISTRICT

Tutwiler Hotel, Birmingham, Ala.
Frank S. Kleeman
Foundry Metallurgical Engineer
"Improvement of Machinability and Other Properties of Iron Castings Through Controlled Deoxidation"

TEXAS

Longview, Texas
W. R. Bond
Lone Star Steel Co.
"Lone Star Steel's Operations"

NORTHERN CALIFORNIA

Shattuck Hotel, Berkeley
J. A. Gitzen
Delta Oil Products Co.
"Physical and Chemical Properties of Core Sand Additives"

TRI-STATE

Wichita, Kansas
William M. Ball, Jr.
R. Lavin & Sons, Inc.
"Gating and Risering"

• MARCH 19

CINCINNATI DISTRICT

Engineering Society, Cincinnati
Lee Everett
Lester B. Knight & Associates
Subject to be announced

OREGON

Heathman Hotel, Portland
J. A. Gitzen
Delta Oil Products Co.
"Proper Use of Sand Additives"

• MARCH 20

EASTERN NEW YORK

Circle Inn, Lathams
E. C. Troy
Foundry Engineer, Palmyra, N. J.
"Steel Foundry Practice"

• MARCH 21

CENTRAL MICHIGAN

Hart Hotel, Battle Creek
O. J. Myers
Archer-Daniels-Midland Co.
"Core Binders, Core Sand and Baking Equipment"

• MARCH 22

WASHINGTON

Gowman Hotel, Seattle
J. A. Gitzen
Delta Oil Products Co.
"Core Sand Additives"

• MARCH 26

NORTHWESTERN PENNSYLVANIA

Moose Club, Erie
Bruce Norris
Allis-Chalmers Mfg. Co.
"Industrial Radiographic Techniques"

• MARCH 30

CHESAPEAKE

Engineers Club, Baltimore
C. L. Lane
Florence Pipe Foundry & Machine Co.
"You Don't Have to Make Bad Iron"
W. H. Johnson
Naval Research Laboratory
Film: *"Finger Gating"*

ONTARIO

Royal Connaught Hotel, Hamilton
Clyde A. Sanders
American Colloid Co.
"Properties and Control of Foundry Sand"

• APRIL 2

WESTERN MICHIGAN

Cottage Inn, Muskegon
R. A. Colton
D. L. LaVelle
Federated Metals Div., American Smelting & Refining Co.
Subject to be announced

Central Michigan

J. T. Ehman
Albion Malleable Iron Co.
Publicity Chairman

Annual Christmas Party was held December 8 at Cascades Country Club in Jackson. Cocktails, favors, a duck or chicken dinner, entertainment and dancing were enjoyed by 104 members and their guests.

Dinner dance chairman was W. W. Stout, Marshall Foundry Co., assisted by Fitz Coghlin, Jr., Albion Malleable Iron Co.; Emil Zeuch, John Bean Mfg. Co.; George Petredean, Calhoun Foundry Co.; William Robb, A. P. Green Fire Brick Co.; Ralph Brooks, Brooks Furnace Co.; and Walter Miller, Battle Creek Foundry Company.

January 17 meeting, held at the Hart Hotel, Battle Creek, was attended by 71 members and their guests. Technical Chairman Palmer Coombs, Riverside Foundry & Galvanizing Co., introduced Coffee Talker Prof. W. W. Snyder, Michigan State College, and the evening's speaker, Kenneth Robinson, consulting and health engineer, Michigan Health Department.

In illustrating *"Foundry Dust Control,"* Mr. Robinson used a miniature exhaust system, and by means of a smoke apparatus, a manometer showing static and velocity pressures, and various types of hoods and baffles, was able to demonstrate vividly the effectiveness of each of different systems. Miniature "man cooler" fans emphasized the decrease in efficiency of the exhaust systems when such fans are used to supplement an actual installation. Assisting in the demonstration was R. S. McClintock of the Division of Industrial Health, Michigan Department of Health.

Mr. Robinson stated that a film on dust control is available, and interested Michigan foundrymen should contact him at the Health Department, Lansing, for further information.

FUTURE CHAPTER MEETINGS

APRIL 2 (CONT'D)

CENTRAL INDIANA

Athenaeum, Indianapolis
L. W. Eastwood
Battelle Memorial Institute
"Unsoundness in Castings and the Role of Gas Evolution"

METROPOLITAN

Essex House, Newark, N. J.
Earl E. Woodliff
Foundry Sand Service Engineering Co.
"Molding Sand"

• APRIL 4

TOLEDO

Toledo Yacht Club
Subject and speaker to be announced.

• APRIL 5

CANTON DISTRICT

Mergus Restaurant, Canton
William T. Bean, Jr.
Industrial Electronics, Inc.
"Good Casting Design—On Purpose!"

• APRIL 9

CINCINNATI DISTRICT

Suttmiller's Restaurant, Dayton, Ohio
Harry H. Kessler
Sorbo-Mat Process Engineers
"Gating and Risering Gray Iron"

CENTRAL OHIO

Chittenden Hotel, Columbus
D. E. Krause
Gray Iron Research Institute
"Cupola Practice"
R. A. Willey
Commercial Steel Castings Co.
"Recent Developments in Weld Repair of Steel Castings"
Also *"Malleable Iron,"* speaker to be announced at a later date.

MICHIANA

Hotel Elkhart, Elkhart, Ind.
G. E. Sims
Battelle Memorial Institute
"Steel Melting and Casting"

• APRIL 10

N. ILLINOIS - S. WISCONSIN

Beloit, Wis.
James H. Smith
Central Foundry Div., GMC
"Future of the Foundry Industry"

TWIN CITY

Covered Wagon, Minneapolis
B. C. Yearley
National Malleable & Steel Castings Co.
"Gating and Heading"

EASTERN NEW YORK

Circle Inn, Lathams
Joint meeting with ASM Chapter

• APRIL 12

ST. LOUIS DISTRICT

York Hotel, St. Louis
E. T. Kindt
Kindt-Collins Co.
"Trends in the Pattern Industry"

• APRIL 13

TRI-STATE

Tulsa, Okla.
Herman L. Smith
Federated Metals Div., American Smelting & Refining Co.
"Melting and Pouring of Copper-Base Alloys"

PHILADELPHIA

Engineers Club, Philadelphia
J. D. James
Cooper-Bessemer Corp.
"Nodular Iron"

TEXAS

Lufkin, Texas
Bruce L. Simpson
National Engineering Co.
"Development of Metal Castings Industry"
Plant Visitation

CENTRAL NEW YORK

Ithaca, N. Y.
Elmer C. Zirzow
Deere & Co.
"Sand"

Detroit

R. Grant Whitehead
Claude B. Schneible Co.
Chapter Reporter

February 15 meeting, held at the Rackham Memorial building, began with a coffee talk by Albert Langtry of the Detroit Police Department's Scientific Bureau, who described modern crime detection methods.

Speaker William A. Hambley, Wilson Foundry & Machine Co., discussed *"Casting Defects"* and showed several interesting slides. Discussion of Mr. Hambley's talk was led by H. G. McMurry, Ford Motor Co., Dearborn.

Washington

Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

January meeting, held at the Gowman Hotel, Seattle, had as its speaker Russell J. Geitman, Link-Belt Co., Chicago, who discussed *"Mechanizing the Small Foundry."*

Materials handling is a major foundry problem, Mr. Geitman pointed out, since an average of 150 to 200 tons of material are handled per ton of castings output. Mechanization, he said, solves this problem by lowering unit cost, increasing production, conserving manpower and space, and improving working conditions.

Each small foundry presents a different problem in mechanization and requires individual study of the nature of its product and its tonnage output. Mr. Geitman advised a carefully-considered over-all plan for step-by-step mechanization to suit the needs of the individual foundry.

The small jobbing foundryman cannot control the type of work in his foundry. Therefore, he must consider flexibility of any mechanized aids to production which he plans to install. His first problem is to relieve the molder of manual labor to increase his effective molding effort.

"Nodular Iron" was the subject of a talk by Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, at the St. Louis District Chapter's January 11 meet.

Any plan for mechanization must be based on an analysis of the flow of material through the foundry. Plan for straight line flow from raw materials to the final products. With these points in mind, start with individual units that will fit needs now and later on may be incorporated in the over-all plan for straightline flow mechanization of materials handling, molding, melting, pouring and cleaning operations, he concluded.

Southern California

S. L. Jackson
Electro Metallurgical Div., Union Carbide & Carbon Corp.
Chapter Reporter

January 12 meeting, held at the Rodger Young Auditorium, Los Angeles, featured as its speaker Leonard F. Lange, Link-Belt Co., Chicago, who discussed the *"Mechanizing of Small Foundries."* Mr. Lange cited as reasons for mechanization (1) lower costs, (2) increased production, (3) conservation of manpower and space, and (4) im-

Meeting with A.F.S National Secretary-Treasurer Wm. W. Maloney at a Western Michigan Chapter Board of Directors meeting, January 22, were standing left to right: Directors H. J. McKay and R. W. Hathaway, Vice-Chairman R. P. Schaffer, Publicity Chairman C. H. Cousineau, and Secretary L. D. Ramsey. Seated, left to right: Assistant Secretary Fred J. DeHudy, Chairman Stanley H. Davis, Treasurer William J. Cannon, A.F.S. Secretary-Treasurer Maloney, and Director Roy H. Herbst. (Photograph courtesy of Frank Beetham, Campbell, Wyant & Cannon Foundry Co.)

provement of working conditions in the foundry.

Foundry management, Mr. Lange said, must survey present facilities in preparation for the national defense armament program. Production increases of 50 to 200 per cent can be achieved by mechanization of sand and molding systems, the speaker said.

Mr. Lange pointed out that mechanization of large foundries has developed means of mechanizing smaller foundries, where more sizes and types of castings can be poured through use of more flexible systems.

It is important, the speaker said, that all mechanization plans incorporate long-range planning, even though intentions are to install units separately from time to time. If a foundry cannot stand the cost of complete mechanization, Mr. Lange recommended installation of standard units for greater economy.

Rochester

Donald E. Webster
American Laundry Machine Co.
Chapter Reporter

January 9 meeting had as its speaker Fred G. Sefing, International Nickel Co., New York, who discussed *"Gating and Risering."*

Mr. Sefing feels that there is much to learn from the pouring of an open mold—such as disclosing the source of dirt—the origin of which may sometimes be mysterious. He also feels that more castings have been lost from pouring too slowly than from fast pouring and recommends that castings in the weight range from 250 to 2000 lb be filled in as short a time as 20 seconds.

Of course, the speaker said, the mold cavity must be well vented to allow this pouring speed and it may be necessary to provide a multiple number of gates from a suitable runner. The rapid filling of a mold avoids, first of all, the building up of stresses and strains, and helps to promote progressive solidification.

The placing of risers, and their dimensions, he added, are also worthy of study in an effort to promote this type of solidification. Mr. Sefing stated that the actual feeding action of a riser takes place at a temperature approaching the freezing point, and that at such temperatures only a portion of the riser is active. This should be taken into consideration in the design of risers.

The subject of core expansion, and its tendency to partially overcome casting shrinkage, was discussed.

British Columbia

T. N. Shewring
Industrial Supplies, Ltd.
Publicity Chairman

January 25 meeting featured a talk by Russell J. Geitman, Link-Belt Co., Chicago, on *"Mechanization of a Small Foundry."* Mr. Geitman covered the subject extensively from the point of view of materials handling in the foundry and illustrated his talk with slides of various types of conveying equipment handling finished castings, molds, shakeouts, etc.

The meeting drew a more-than-average turnout of members and guests. An attendance prize of an electric iron was won by William Armstrong, University of British Columbia, Vancouver, chapter vice-chairman.

Cincinnati District

Martin E. Rollman
Cincinnati Milling Machine Co.
Chapter Chairman

Forty-five members and guests attended the January 8 meeting, which opened with a showing of two films on the manufacture of chaplets, courtesy of Fanner Mfg. Co., Cleveland.

Aubrey J. Grindle, Whiting Corp., Harvey, Ill., discussed *"Dust, Fume and Smoke Prevention,"* in which he reviewed the past history of attempts to

(Continued on Page 76)

Talking shop during Central Indiana Chapter's December 4 meeting were, left, technical chairman Elmer Braun, Central Foundry Division, GMC, and speaker Charles O. Burgess, Gray Iron Founders' Society, Cleveland.

Chapter Officers FAS and Directors

W. M. Armstrong
University of British Columbia
Vancouver, B. C., Canada
Vice-Chairman
British Columbia Chapter

James L. Payne
Ross-Meehan Foundries
Chattanooga, Tenn.
Director
Tennessee Chapter

O. Jay Myers
Werner G. Smith Div., Archer-Daniels-Midland Co., Minneapolis
Director
Twin City Chapter

Vaughan C. Reid
City Pattern Fdy. & Mach. Co.
Detroit
Vice-Chairman
Detroit Chapter

Robert A. Willey
Commercial Steel Casting Co.
Marion, Ohio
Director
Central Ohio Chapter

R. S. Whitehead
Electro Refractories & Alloys
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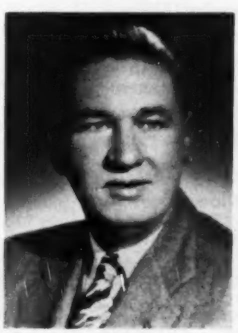
A. C. Boak
Non-Ferrous Casting Co.
Toronto, Ont., Canada
Director
Ontario Chapter

Charles N. Jacobson
Dake Engine Co.
Grand Haven, Mich.
Director
Western Michigan Chapter



George E. Tisdale
Zenith Foundry Co.
Milwaukee
Vice-President
Wisconsin Chapter

Frank P. Volgstadt
Griswold Mfg. Co.
Erie, Pa.
Chairman
Northwestern Pennsylvania Chapter

W. B. Coleman
W. B. Coleman & Co.
Philadelphia
Secretary-Treasurer
Philadelphia Chapter

CHAPTER ACTIVITIES

(Continued from Page 74)

eliminate air pollution caused by cupolas and pointed out foundry problems arising from stricter air pollution ordinances.

Mr. Grindle described several types of dust prevention equipment, such as electrostatic precipitators, cloth bag and screen collectors, water washers and centrifugal collectors, describing the relative advantages of each in removing fine particles.

The speaker showed a color film illustrating basic principles of various

Speakers' table occupants at Tennessee Chapter's December 1 meeting were, seated, left to right: speaker James H. Smith, Central Foundry Div., GMC, Saginaw, Mich., and Vice-Chairman Porter Warner, Jr. Standing, Director Karl H. Landgrebe; and Sam W. Healy of Central Foundry Division, GMC.

types of dust collection equipment and typical installations filmed during cupola operation.

In conclusion, the speaker predicted that the necessity for better control of emitted smoke, fumes and dust would make today's smokestacks extinct within 25 years.

The Chapter's Annual Christmas Party, held December 16 at the Netherlands Plaza Hotel, Cincinnati, was attended by some 500 members and guests. Ladies were given beautiful multi-colored silk scarves as favors. Throughout the traditional turkey dinner, two strolling accordionists played Christmas carols, inducing some excel

(Continued on Page 78)

when you need CORE BOX PROTECTION ...it's MARTIN

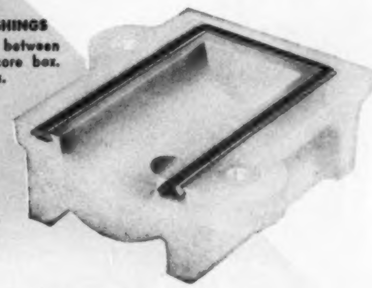
Every Martin product is designed especially for "core box protection"—each is built to prevent a specific type of wear on your core boxes. They are engineered by foundry men to assure easy installation, successful operation. Martin products add years to the life of your equipment by enabling you to salvage old plates and core boxes, by preventing abrasion, and giving your plywood blow plates the lasting qualities of steel. Each product carries a guarantee of absolute satisfaction. Martin products are distributed all over the world by foundry supply houses.

"PROTEXABOX PINS"
Cannot mar the box face because they will not loosen. Protective rubber tip guaranteed to stay on.

"SAND ARRESTER TUBE"
Save cores and step up production. Guaranteed for 100,000 blows.

"HOLINER" BUSHINGS
Stop abrasion between blow plate and core box. Protect blow holes.

"PULLINSERT" BLOW BUTTONS
Positively stop sand blasting under blow holes. Available in nine popular sizes.



"STRIPINSERT"
Protects parting line—easily installed in old or new boxes. Cutters for groove available at moderate cost.

"VIBROLATOR"

The powerful all-directional vibration of the Peterson Vibrolator makes this an ideal unit for keeping materials flowing in chutes or hoppers. The Vibrolator will not crack attaching lugs on match plates or core boxes. Instantly self starting and virtually noiseless in operation, this new type vibrator eliminates maintenance worries and gives a long, dependable service life. No lubrication is necessary. The Vibrolator is light in weight to lessen fatigue and permit maximum delivery of vibration. There are five sizes available to meet all your foundry requirements. Peterson Vibrolators are sold only by Martin, exclusive manufacturers of ball-type vibrators.

"VIBROLATOR"

WRITE for folders describing these Martin products in detail. If you have a sand movement problem, send us complete information and our engineers will prescribe the correct vibrator for your needs.

MARTIN ENGINEERING COMPANY
KEWANEE, ILLINOIS

CHAPTER ACTIVITIES

(Continued from Page 76)

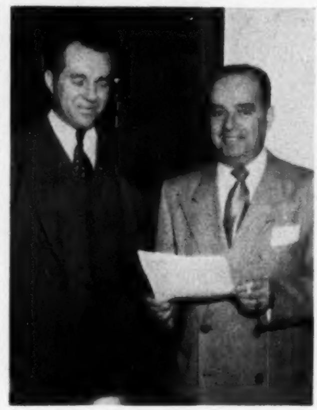
lent community singing. Following dinner was a five-act floor show and each act drew several encores. Climaxing the evening was a dance that lasted until 2:00 a.m.

University of Minnesota

Gerald A. Sporre
Chapter Secretary

JANUARY 24 MEETING was held in the University's Mechanical Engineering Building, with Gordon S. White, Central Foundry Div., GMC, Saginaw, Mich., showing the Malleable Founders' Society film, *"This Moving World,"* and following the showing with a talk on how Central Foundry Division has improved its facilities in recent years.

The day following his talk, Mr. White interviewed students interested in full time or summer work in GMC's Central Foundry Division.



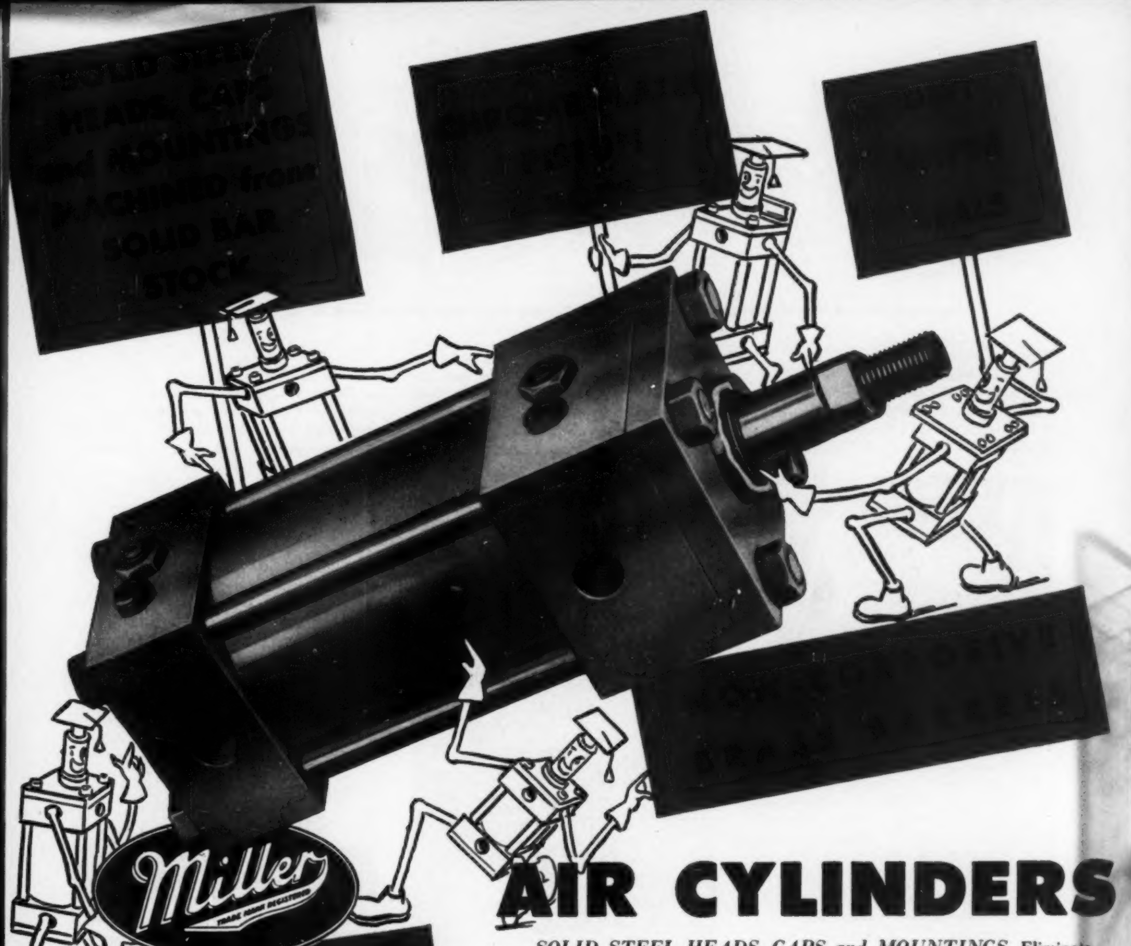
A. P. Gagnebin, International Nickel Co., New York, (left) introduced speaker Harold L. Ullrich, Sacks-Barlow Foundry Co., Newark, N. J., at Metropolitan Chapter's January 8 meeting at the Essex House, Newark. (Photograph courtesy of John Bing, Metropolitan Refractories Corp.)

Central Indiana

Paul V. Faulk
Electric Steel Castings Co.
Publicity Chairman

NATIONAL OFFICER'S NIGHT, held February 5 at the Athenaeum, Indianapolis, brought out the following guests: A.F.S. National Director Martin J. O'Brien, Jr., Symington-Gould Corp., Depew, N. Y.; Past Chapter Chairman I. R. Wagner, Electric Steel

(Continued on Page 83)



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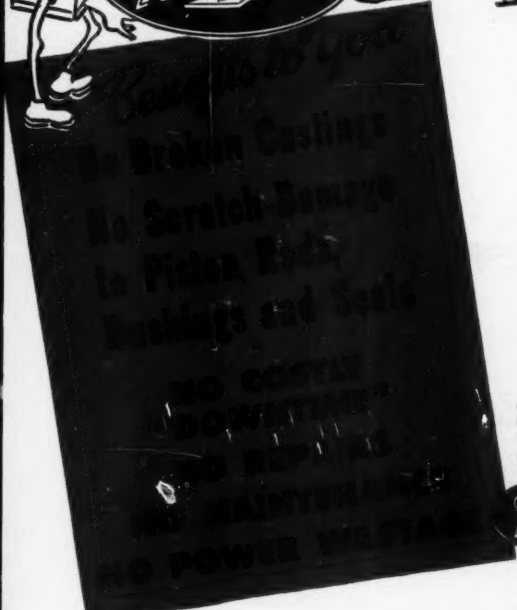
HARD CHROME PLATED PISTON RODS. 90,000 to 110,000 psi yield point heat treated stress relieved steel, accurately ground, polished, then hard chrome plated for extra high resistance to the scratches that commonly cause leakage.

DIRT WIPERS. Wipe piston rods clean on every "in" stroke, protecting piston rods, seals, and bushings from scratch-damage by dirt, scum, abrasive particles. Standard construction on ALL Miller Cylinders — *both Air and Hydraulic.*

NON-CORROSIVE BRASS BARRELS. Eliminate the rust and corrosion caused by moisture always prevalent in plant air lines. Standard construction on all Miller Air Cylinders.



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NEW *Foundry Products*

For additional information on New Products, use postcard at bottom of opposite page.

Heat Resistant Conveyor Belt

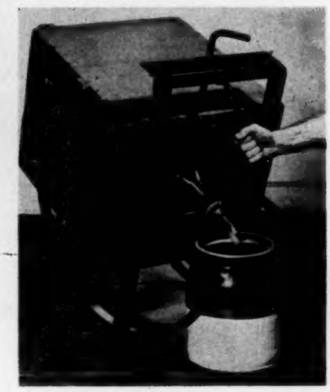
1—Super-Insulated Sahara, a belt for conveying materials at temperatures up to 600 F, is made of heavy silver duck combined with asbestos and special insulating materials, and has been used successfully in handling such foundry materials and products as red-hot castings and foundry shakeout sand. Manufacturer claims in actual foundry usage belt paid for itself in 30 days by eliminating down time, and has outlasted previously-used belts two-to-one. *Imperial Belting Co.*

Interchangeable Lens Goggle

2—Removable and interchangeable one-piece plastic lens, which will fit either a safety goggle, "Saf-I-Duo" or a safety spectacle, "Saf-I-Spec," is available in clear or anti-glare green. Goggle frame is made of soft vinyl plastic, unaffected by acids or alkalis, yet pliable enough to effect a tight seal against the face, offering full protection from acids, dusts and flying objects. Four types of ventilation are available. Safety spectacle is also of all-plastic construction. Low in cost, the one lens fits both goggle and spectacle, effecting greater savings. *United States Safety Service Co.*

Acid Pourer

3—GS No. 11 Carboy Tilter and pouring spout provides a safer, faster and easier method of pouring acids and other liquids from carboy. Functional design incorporates welded and riveted structural steel construction, while acid-resistant rubber air vent pouring spout insures smooth flow of acid without spurts or splashes at a flow capacity of 5 gallons per minute. *General Scientific Equip. Co.*

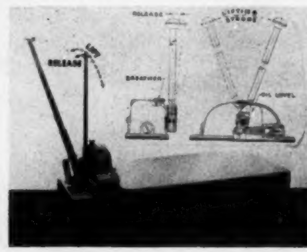


Fan Nozzle

4—New line of flat spray or fan nozzles are claimed by manufacturer to produce more uniform coverage with less waste of spray, eliminate side-jets containing coarse droplets, and concentrate heavier spray pattern in center than at edges of the fan. Also claimed is less over-spraying due to doubling-up of sprays from adjacent nozzles. Bete F Series nozzles include 13 stainless steel discs with flow rates of 1/10 to 10 gpm and spray angles of 50 to 90 degrees. All discs are interchangeable in brass base having ¼-in. male pipe connection. Built-in, removable strainers are available for smaller nozzles. *Bete Fog Nozzles, Inc.*

Load Lifter

5—Lightning Load Lift features aluminum single-unit oil tank and pump combination to raise loads with 25 per cent greater ease and speed, manufacturer claims. Truck is lowered by simple, right-angle flick of the handle, eliminating stooping or bending to lower loads. Truck raises or lowers with same lifting handle while operator stands. New one-pump unit eliminates need for gaskets, dust boot and needle valve. Pump fits interchangeably into all standard Load-Lifts and may be purchased as a separate unit. Other features: greased-for-life sealed ball bearings, cushion rubber or plastic wheels, double ball-bearing fifth wheel to permit easy steering with any handle position and in crowded, narrow aisles, separate lifting and lowering mechanism, and arc-welded frame. *Market Forge Co.*



Battery Operated Tractor

6—Load-Mobile Tractor is only 44-in. long, making it particularly adaptable to foundries where space is at a premium,

and will haul trailers in single or multiple loads, or will lift loads by rope and tackle. Featuring a 3-way operating position, Load-Mobile may be driven by (1) operator facing away from load, (2) operating facing load for narrow passages, and (3) riding step provided for easy access on and off truck. Load-Mobiles are available in 3000 and 5000 lb capacity models with 500 to 800 lb draw bar pull; no load speed of 3.5 to 4.0 mph; full load speed of 2.5 to 3.0 mph; overall length of 44 in., and overall width of 20 in. *Market Forge Co.*

Portable Air Compressor

7—Large portable air compressor, the Gyro-Flow 600, delivers 600 cfm free air at 100 psi. Weighing only 9,500 lb, Gyro-Flow 600 has two-stage, oil-cooled, rotating-vane compressor and requires no pistons, con rods, valves or clutch. Air is discharged at less than 200 F under normal operating conditions. New development combines variable intake unloading of compressor and floating speed control of engine for steadier and higher air pressures. Separate engine and compressor stack-type air filters are easily accessible. Eight-hour capacity fuel tanks are standard equipment, as are automotive steering, spring mounting, parking reflectors, mud guards. *Ingersoll-Rand Co.*

Heat-Resistant Aluminum Paint

8—Heat-Rem H-170 is a high heat resistant aluminum paint capable of withstanding temperatures up to 1700 F. Paint utilizes a silicone base and fuses wth surface metal immediately upon application, forming a bright elastic finish resistant to moisture, corrosion, mild acids, alkalis and industrial fumes. H-170 sets in four hours and dries completely overnight on hot surfaces. Packaged in quart, gallon and five gallon cans. *Speco, Inc.*

All-Service Hose

9—Servall, a new all-service hose, is made of synthetic rubber and resists moderate amounts of gasoline, oil, weak inorganic acids and alkalies. Eliminates need for carrying stocks of special hose for different uses when service needs are infrequent and banishes hazards of using a hose not designed for more than one service. Tough, flexible and long-lasting. Servall hose can be used for air, hot and cold water and for "dry" gasoline or oil service where hose is not filled except for infrequent refueling. Also can be utilized for mild chemicals, grease, paint and low-pressure chemical spray service. Servall is available in diameters ranging from 3/16 in. to 3/4 in. and in working pressures varying from 225 to 300 lb. Servall comes in standard reel lengths of 400 to 600 ft or in cut lengths. *Hewitt-Robins, Inc.*

Arc Welders

10—New 80 Series industrial arc welders operate on a-c and are available in three sizes—200, 300 and 400 ampere capacities—for heavy duty, 'round the clock production welding. Key feature of the Series 80 welders is the use of Hipersil steel transformer cores, which provide one-third greater flux-carrying capacity. *Marquette Mfg. Co.*

Heavy Duty Crane

11—Model 20 heavy duty crane for industrial yard lifting and materials handling has lifting capacity of 6 ton at 10-ft radius with standard counterweight, and 10 ton with outriggers extended and auxiliary counterweight. Self-propelled and rubber mounted, crane has working weight of 27,920 lb and will accommodate up to a 39-in. magnet or 1/2 yard clamshell and dragline buckets in addition to lifting crane operation. Single gasoline or diesel engine supplies power. Model 20 travels, lifts, booms and swings simultaneously or independently. Four-point walking beam suspension provides equal stability while lifting or digging even on rough terrain. Full 360-degree operation, 7-ft, 8-in. wheelbase and short turning radius facilitate operations in tight spots. *Wayne Crane Co., Inc.*

Fire Brick

12—Walsh Mullitex, a high burn super duty fire brick, is claimed by manufacturer to have high mechanical strength and resistance to heavy loads, temperature variations, corrosion, abrasion, slag action and shrinkage and is recommended for installation where severe service conditions and extreme temperature variations combine with need for high resistance to slag action. Tunnel kiln-burned to a much higher temperature than standard super duty fire brick, Mullitex HB is composed of 100 per cent Missouri clays. *Walsh Refractories Corporation.*

CO_2 Weighing Device

13—Alfco System Weighing Device weighs carbon dioxide cylinders, which are part of a fixed fire-fighting installation, and must be properly weighed to insure proper operation. Without taking system out of service, operator loosens cylinder clamp bolts, inserts fulcrum under valve neck, presses a hand lever until cylinder clears floor and reads scale for weight. Made of channel iron, unit has 200 lb weight capacity. *American La-France Foamite Corp.*

Air Vises

14—Vi-Speed Air Vises feature hardened tool steel interchangeable jaw faces with either serrated or smooth faces. Faces are firmly attached to jaw castings by spring-tempered pins and are quickly and easily removed by punching out pins. Other faces can then be installed. *Van Products Company.*

Vitrified Bonding Wheels

15—Vitrified bonding wheel, the 79E, is recommended by manufacturer for portable grinding of annealed malleable castings, steel castings and brake drums and is said to assure smoother, faster cutting action for speeds up to 6000 surface fpm. Longer production time per wheel is also provided, with lowered downtime for change-over and wheel dressing. Free samples of 79-E wheels available. *Chicago Wheel & Mfg. Co.*

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[illegible] Technical Sessions in [illegible], by [illegible], was erroneously reported in the American [illegible] literature section [illegible] as being available at no cost. The price is [illegible].

Super Refractory Cement

82—Bulletin 314, illustrated, describes properties, advantages and applications of Taylor [illegible] Super Refractory Cements. Slag resistance, workability, freedom from shrinkage, inertness in either oxidizing or reducing atmosphere and good bonding strength over wide range of temperatures are shown in detail. Photomicrographs show contrast between Tufil No. [illegible] cement and ordinary refractory cement, while other photographs show product's application in a variety of industries. Back cover contains chart guide for selection and use of Tufil cements. *Chas. Taylor Sons Co.*

Sand Blower

83—Applications, advantages and operating characteristics of the CB-40 Series San-Blo, claimed by manufacturer to be the first all-purpose sand blower, are given in 8-page, illustrated Bulletin CB-2. Explained in detail are the new blow head with motor-driven plows and aerating air circuit, and the advantages of the San-Blo in a variety of foundry applications. Photographs and complete specifications and applications are given for DeLuxe Model CB-40-D, with automatic clamping and self-adjusting table with 6-in. stroke; and for Bench Model CB-40-F, with automatic clamping. Bulletin concludes with testimonial letters from several foundries now using the San-Blo. Also briefly described are Bench Model CB-40-P, with automatic clamping, and Vibra-Draw Core Drawing Machine. *Federal Foundry Supply Co.*

Crucibles

84—16-page catalog of American Crucibles and other graphite products, is designed as a working handbook to help the foundryman in specifying equipment for melting all types of metals. Data of general interest presented in the catalog include notes on care and handling of crucibles, properties of metals, use of natural and forced draft furnaces, oil and gas-fired furnaces, tongs, storage and annealing. *American Crucible Co.*

Core Plates and Slip Jackets

85—4-page folder illustrates and describes J-M Transite Core Plates, for use in both ferrous and non-ferrous foundries, and Transite Slip Jackets, which because of their asbestos-cement composition, will not burn and retain their original shape despite runouts or spillovers. In addition to outlining the advantages, uses and composition of these products, the folder contains charts showing minimum thicknesses and weights of Transite Core Plates and sizes and weights of Transite Slip Jackets. *Johns-Manville.*

Zircon Products

86—12-page illustrated folder describes properties and applications of Zirconite Sand, a natural zircon sand specially adaptable to foundry use because of its fineness, uniformity and refractoriness in cores, molds and facings. Charts show screen analysis, and comparative properties of zircon and silica sands, and sample core mixes. Also described are zirconite flour, zirconite mold and core washes. Photomicrographs and photographs of typical castings made with zirconite sands illustrate the text. *Titanium Alloy Manufacturing Div., National Lead Co.*

(Continued on Page 95)

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CHAPTER ACTIVITIES

(Continued from Page 78)

Castings Co., Indianapolis, 1951-52 nominee for A.F.S. National Vice-President; and A.F.S. National Secretary-Treasurer Wm. W. Maloney, who spoke on the aims and accomplishments of A.F.S.

Mr. Maloney pointed out that the Society is not a trade association, nor is it concerned with prices, labor or any foundry phases not of a technical nature.

Following Mr. Maloney's talk, two films were presented: *"This Moving World,"* the Malleable Founders' Society film on the malleable foundry industry, and *"What Is Americanism?"*, a cartoon film produced by Harding College. The films were shown through the courtesy of Carl Schopp, Link-Belt Co., Indianapolis.

MIT

Eugene Rapperport
Technical Secretary

An informal dinner preceded the December meeting, which featured a hard-hitting talk by George K. Dreher, Foundry Educational Foundation, Cleveland—*"Let's Be Practical."*

Mr. Dreher discussed the physical and mental requirements of managerial personnel. Good management, he said, is a blend of experience, ability and education.

Practical psychology in personnel handling was cited by Mr. Dreher as an important factor in management, particularly the instilling of safety consciousness and pride-of-work in foundry employees.

Still in a practical vein, Mr. Dreher continued by stressing the necessity of management's giving credit to labor where credit it due—and not being fooled by the "face-walker"—the fellow who always knocks the next man into the mud, or the "time sponger." It is necessary, Mr. Dreher said, to know the customs and habits of employees, their constraints and limits.

Education, the speaker concluded, is not an end in itself. Its practical value is to get an edge on competition. Education must walk with ability, Mr. Dreher concluded.

St. Louis District

Norman L. Peukert
Carondelet Foundry Co.
Publicity Chairman

JANUARY 11 MEETING, held at the York Hotel, St. Louis, had as its guests A.F.S. National Director Norman J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio, and Drs. Eppelsheimer and Schlechten of the Missouri School of Mines, accompanied by some 25 or 30 student chapter members.

The meeting was opened by Chapter Chairman J. H. Williamson, M. A. Bell Co., and after a brief business session Dr. Schlechten, head of the Metallurgy Department of the Missouri School of Mines, was introduced. Dr. Schlechten expressed the appreciation of the group for being invited by the St. Louis Chapter to attend the meeting, and introduced Dr. Eppelsheimer, who gave a complete progress report on School activities, both in the foundry course and the Student Chapter. He praised the help given both activities by members of the St. Louis Chapter and mentioned assistance to worthy students given by the Foundry Educational Foundation. He was quite proud, he said, to announce that the MSM Student Chapter is the largest in the country.

Technical Chairman for the meeting was Fred Riggan, Key Company. Mr. Riggan introduced Charles K. Donoho, American Cast Iron Pipe Company, Birmingham, Ala., who spoke on *"Nodular Iron."* Mr. Donoho's talk was accompanied by the use of well-prepared slides, and brought out the fact that nodular iron can be produced by

element additions to cast iron other than cerium and magnesium, namely, calcium, tellurium, strontium, lithium, selenium, sodium, and several others. The main requirement in producing nodular iron, Mr. Donoho said, is to add the above elements to a desulphurized cast iron and the lower the sulphur content, the lower the per cent addition of the element needed to produce nodular iron.

Mr. Donoho explained desulphurizing during melting by using a basic lined cupola. This phase was interesting, as it is a new approach to production of nodular iron. The speaker stressed that the new material lacks the complete development that will place it in direct competition to other engineering metals but, he added, great possibilities are present.

The meeting was preceded by an afternoon meeting of the Board of Directors of the chapter, at which time Mr. Dunbeck gave a report on activities of the Society.

Twin City

J. D. Johnson
Archer-Daniels-Midland Co. (The Werner G. Smith Co. Division)
Chapter Reporter

FEBRUARY 13 MEETING featured a talk by E. T. Kindt, Kindt-Collins Co., Cleveland, on *"Trends in the Pattern Industry,"* in which he outlined the history of patternmaking and its importance to the foundry, and, in turn, the importance of the foundry to the national economy.

In his talk, Mr. Kindt covered such phases of patternmaking as construction of a modern pattern shop, figuring costs on wood and metal patterns, intelligent selling of pattern equipment, standardization of pattern components and construction, and application of plastics and plaster in patterns.

Mr. Kindt concluded his talk with showing of a film on patternmaking supplies and machinery.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

JANUARY 26 DINNER MEETING was attended by some 40 members and guests who viewed the new sound-color A.F.S. Research Film, *"Fluid Flow in Transparent Molds—II,"* with A.F.S. Technical Director S. C. Massari narrating the film and answering questions on points brought out in the film.

December 1 meeting had as its speaker James H. Smith, Central Foundry Div., GMC, Saginaw, Mich., who discussed *"The Future of the Foundry Industry."* Mr. Smith stated that the foundry industry must advertise itself and its product in order to meet in-

creasing competition from other metal fabricating processes.

Top priority in the foundry industry, Mr. Smith said, should be given more modern equipment, cost reductions, improved inspection methods, new and better sales approaches, and tremendously improved castings products at lower costs.

Mr. Smith concluded by citing the need for improved in-plant training of employees and supervisors, and praised work of the Foundry Educational Foundation in bringing top flight engineering college graduates into the foundry industry.

Western New York

Marvin E. Taublieb
Frederic B. Stevens, Inc.
Publicity Chairman

FEBRUARY 2 MEETING speaker was Lieut. Thomas M. Brown, Erie Railroad Police, Cleveland System, who spoke on *"Magic and Safety,"* in which he described railroad police work, which he said, although primarily that of investigation, is also vitally concerned with safety.

Lieut. Brown stated that 1700 children were killed on railroad property in 1950 because they use railroads as playgrounds. The fascination of railroading, he said, attracts children to the tracks. Lieut. Brown used sleight-of-hand tricks to point up his story on safety, and urged adults to set a good safety example to children.

Following Lieutenant Brown's talk, Rudolph Wilke, American Radiator & Standard Sanitary Corp., led a round table discussion on blowing basic cupola refractory linings. The discussion brought out that sulphur as low as .025 is considered normal in a basic lined cupola.

In blowing refractory materials and lining cupolas, it was learned that several foundries are having trouble with patching breaking away. Refractory manufacturers hope to correct this defect by use of improved bonding material in the near future.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Secretary

THE 100 MEMBERS attending the January 22 meeting heard A.F.S. National Director Thomas E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., on *"Engineering Properties of Gray Iron for Foundrymen."*

Mr. Eagan stated that gray iron of varying structures, if properly controlled, can be cast to meet a wide variety of tensile and elongation property requirements.

Today's foundryman, he said, should

be able to advise designers on ways to minimize castings scrap losses. Melts, he added, must be of proper metals and care should be taken to insure that no impurities are in the scrap that might possibly prove detrimental to the casting.

Discussion of points brought out by Mr. Eagan was led by Fred Eisert, Urick Foundry, Erie. Chapter Secretary Earl M. Strick, Erie Malleable Iron Co., presided at the meeting and announced that the chapter has contributed an initial gift of $500 to the A.F.S. Building Fund.

The chapter's Holiday Party was held the evening of January 12 at the Siebenburger Singing Society club rooms in Erie. Some 250 members and guests enjoyed dinner, refreshments, professional entertainment from Buffalo, and were recipients of more than 100 door prizes contributed by friends of the chapter. Large delegations of foundrymen from Dunkirk, N. Y.; Meadville, Pa.; Grove City, Pa.; Jamestown, N. Y.; and Zelianople, Pa., attended the party.

Harold Lolley, Bucyrus-Erie Co., party chairman, was assisted by Jacob Diemert, Erie Castings Co.; William Piper, Erie Bronze Co.; Clyde Cooper, Keystone Brass Foundry; William Miller, Frederic B. Stevens, Inc.; and Fred Carlson, Weil-McClain Co.

Metropolitan

John Bing
Metropolitan Refractories Corp.
Publicity Chairman

JANUARY 8 MEETING had as its speaker Harold L. Ullrich, Sacks-Barlow Foundries, Inc., Newark, N. J., who spoke on *"Ductile Iron."* The speaker was introduced by A. P. Gagnebin, International Nickel Co., New York, technical chairman for the evening.

Mr. Ullrich cited several reasons why ductile iron is coming into more general foundry usage. They are:

(1) For castings requiring a higher yield and tensile strength than that of malleable iron.

(2) Castings having a higher resistance to heat than gray iron.

(3) Castings requiring higher physical properties than those found in gray iron.

(4) Castings where ductile iron permits economical design changes that are not possible with gray iron, malleable iron, bronze, etc., because of higher physical properties.

(5) Castings too intricate to be cast in steel, yet with higher strength than those of gray or malleable iron.

(6) Castings needing ductility, but having too heavy a section to be cast in malleable iron.

Mr. Ullrich said that ductile iron

has been poured daily at Sacks-Barlow since February, 1950, and that work has been done on melting in a basic lined cupola. The advantages hoped for, he said, are that the melt will be low in sulphur and that carbon pickup will be much greater than that in the acid lined cupola.

These factors, he concluded, would be of great benefit in the production of ductile iron and will undoubtedly be achieved in the near future.

Detroit

R. Grant Whitehead
Claude B. Schneible Co.
Chapter Reporter

First meeting of the new year started with a bang as Sergeant Harry Reeves, pistol expert of the Detroit Police Department, put on an excellent demonstration.

Chairman Jess Toth, Harry W. Dietert Co., introduced several new members and visitors, two of them members of the Birmingham Chapter. Two men won free dinners for guessing closest in a "guess the number of shot in the jar" game. The proceeds went into the A.F.S. Building Fund.

Speaker of the evening was Nelson C. Meaghley, Willys-Overland Motors, who gave an interesting talk on methods for improving products and cutting foundry costs.

A short, but informative discussion period, conducted by Mr. Meaghley and supported by George Bluth, also of Willys-Overland Motors, concluded the evening session.

The Chapter would like to compliment Walter Ring on his work as chapter photographer.

Western Michigan

C. H. Cousineau
Carpenter Brothers, Inc.
Publicity Chairman

January 8 meeting was held at the Cottage Inn, Muskegon, with 127 members and guests enjoying a smorgasbord and roast beef dinner.

Speaker of the evening was Clyde A. Sanders, American Colloid Co., Chicago, who discussed *"Mold Materials and Their Effect on Metal Shrinkage."* Assisting Mr. Sanders were Charles C. Sigerfoos and H. L. Womochel, associate professors, Mechanical Engineering Dept., Michigan State College, East Lansing.

Mr. Sanders told of experiments made at Michigan State under carefully controlled conditions, with varying molding sands, binders, etc., and of the difference in apparent shrinkage obtained with different combinations of these molding materials.

Used wisely, he said, these experiments will give the foundryman an added tool to help control a trouble-

some variable that has caused concern to the foundry industry.

February 8 meeting, held at the Cottage Inn, Muskegon, was attended by 107 members and guests, with Harry E. Gravlin, Ford Motor Co., Dearborn, Mich., leading a discussion on *"Sand, Men or Metal?"*

In reality, Mr. Gravlin conducted a casting clinic, to which many members brought problem castings. These were analyzed by Mr. Gravlin and the audience. The speaker was especially adept at drawing the audience into the discussion and had an unusual number of foundrymen participating.

The speaker's approach from the angle of *"Sand, Men or Metal?"* brought out the fact that many defects can be attributed directly to the "men" part of the title, either because of ignorance, carelessness or lack of application to the problem at hand.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Secretary

THREE-STAR MEETING of the chapter was held February 9 at the Beacon Inn, Meadville, Pa., with Joseph Hornstein, Meadville Malleable Iron Co., and Norman J. Birch, National Bearing Div., American Brake Shoe Co., as meeting co-chairmen.

The Tetrachords, a quartet led by Jack Hornstein, son of Meadville Malleable Iron Co.'s general manager, opened the program with a fine selection of popular numbers. Coffee talk was presented by Dr. Herman Offner, dean, Edinboro State Teachers College, Edinboro, Pa., who spoke on *"Observations on German Life and Conditions as I Saw Them."*

Dr. Offner, who spent three years in Germany with the State Department following World War II, said that the United States is making a sincere effort to help the German people, and that the Germans, although skeptical at first, are beginning to appreciate our efforts in their behalf.

J. W. Grewell, Westinghouse Electric Corp., Sharon, Pa., spoke on *"Human Relations—Our Number One Job,"* in which he said U. S. technicians are leading the world in every kind of scientific development, but that it must not be forgotten that human relations are equally important.

Mr. Grewell passed around a chart showing that employees fall into seven categories, and that by classifying all employees into their proper groups, management can do much to improve working conditions and attitudes of employees. A happy worker, Mr. Grewell said, is "contagious" and his enthusiasm for his work soon spreads to others in the organization.

LETTERS

(Continued from Page 62)

izing alloys, it appears that the silicon content of these alloys has been insufficiently considered. It is quite true that additions of magnesium alone or as nickel or copper alloys will produce a mottled or white iron unless secondarily inoculated. It is also true, however, that many of the magnesium-ferrosilicon alloys will give a perfectly gray, partially ferritic nodular iron without secondary inoculation. In the latter case it is probable that on addition of the alloy the magnesium volatilizes and dissolves first, then the ferrosilicon dissolves later to give essentially a two-stage process with a single addition. We suggest that the silicon content of Prof. De Sy's alloys (about 50 per cent) may be similarly responsible for the production of ferritic nodular irons with a single addition.

We agree that the basic cupola process for producing a low sulphur iron will contribute a great deal toward making many of these nodular processes practical and economical.

CHARLES K. DONOHO, *Chief Met.*
American Cast Iron Pipe Co.
Birmingham, Ala.

Having had the opportunity of reading in manuscript the paper by Prof. De Sy which was published recently in AMERICAN FOUNDRYMAN, the writer is taking the liberty of making some comment. Prof. De Sy is and has been contributing in a major way to the study of nodular cast irons in general. We are all interested in the possible use of nodulizing agents other than magnesium, both from the practical viewpoint and for the light that is shed on the graphitization mechanisms involved. Prof. De Sy is not only exploring the promising alkali elements thoroughly, but is publishing the results so that all may benefit.

Although De Sy shows that the use of calcium can result in nodular structures free of carbide without the use of ferrosilicon post-inoculation, it would seem possible to the writer that calcium could still be a powerful carbide stabilizer. There is still no convincing demonstration of the mechanism of formation of nodular (or flake) graphite as cast, and Morrogh showed a year ago that calcium acted as a strong carbide stabilizer. It should appear to the writer that unknown factors may be involved, which cannot be uncovered until accurate quantitative analytical methods for calcium content are developed. The British Cast Iron Research Association is believed to be working on such an analytical method.

Although it is mentioned in the paper that the test bars poured were small and not always sound, the mechanical properties given are of considerable interest. Consistently, the tensile strengths seem low when considered in conjunction with the elongations and microstructures, in comparison with magnesium-treated nodular irons. This is also to some extent true of cerium-treated nodular irons, and there would seem to be different strenthening effects of the various added nodulizing agents, aside from the formation of nodu-

(Continued on Page 91)

FOUNDRY FIRM *Facts*

Lone Star Steel Co., Dallas, Texas, on December 4 dedicated and put into operation its new cast iron pressure pipe foundry before a crowd of 300 prominent industrialists and government officials. Principal speaker at the dedication was Leon H. Keyserling, chairman of President Truman's Council of Economic Advisors.

Started during World War II, Lone Star produced pig iron under government contract and since 1948 has been a privately-owned producer of pig from low-grade Texas ores. The company's new pipe foundry will use one-third of Lone Star's entire pig output and is located close to the company's 1100-ton blast furnace, which in turn is within two miles of ore deposits. Another feature of this operation, called the most closely-knit of its kind in the world, is use of coal from company-owned mines just over the Oklahoma line, transported by Lone Star's wholly-owned subsidiary, Texas & Northern Railroad.

Using mechanized and automatic aids wherever possible, the new foundry employs a large gantry crane to unload pig and scrap and to load cone-bottom charging buckets. Two No. 10 cupolas, charged automatically, can melt 25 ton of iron per hr, are lined to a diameter of 72 in., and are operated alternately.

Pipe is centrifugally cast in permanent metal molds in accordance with Federal Specification WW-P-421. In this process, pipe is cast in a cylindrical, water-cooled metal mold which is rotated around a horizontal axis while molten metal is fed into it at a uniform rate. Mold also moves away from point of pour for even distribution of metal.

Where bell and spigot pipe is manufactured, sand core is inserted in end of mold to form the inside contour of the bell. During spinning, the metal is held against inside wall of mold by centrifugal force. Machine continues to rotate until pipe has cooled to about 1500 F. Pipe is then removed from mold by anchoring one end of joint while mold is withdrawn. Lone Star now has three casting molds and will soon install a fourth. Present equipment permits casting 6 to 12 in. diameters.

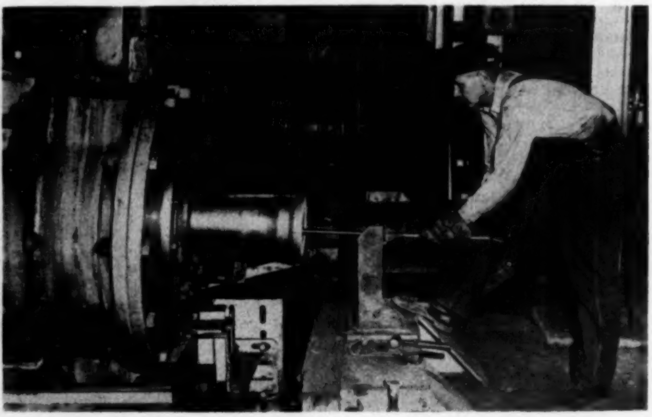
After pipe is removed from mold, it is carried by monorail to a 96-ft-long annealing furnace. Pipe moves through furnace by conveyor and remains in the oven 1 hr, is then cooled, reamed and ground. It then goes into a tar-dip bath, and, finally, is subjected to a 500-lb test. As a further refinement, cement lining is sometimes applied.

H. K. Ferguson Co., Cleveland-New York-Houston industrial engineers and builders, announces the acquisition of the Painesville, Ohio, plant of the **Diamond Magnesium Corp.** The plant, constructed for defense purposes in 1941 and idle since 1945, will be rehabilitated by Ferguson and will be operated by **Diamond Magnesium Corp.** The plant is expected to be in operation by April and is expected to produce some 72 million lb of magnesium in two years.

Reynolds Metals Co., Richmond, Va., will shortly begin construction of an $80 million aluminum reduction plant near Corpus Christi, Texas. A 175,000 kw electric power plant will be built to furnish power for the aluminum reduction plant, which will be housed in four pot line buildings each 1600 ft long. There will also be a carbon plant and several other buildings. Soderberg anodes will be used. In the operation's initial stages, alumina will be shipped from the company's plant at Hurricane Creek, Ark. Later, an alumina plant with 1,000 ton daily capacity will be erected adjacent to the Corpus Christi reduction plant. Privately financed, the new plant is part of the Government's national defense aluminum expansion program.

Allis-Chalmers Mfg. Co., Milwaukee, has opened a new branch office for its General Machinery Division at Wichita, Kansas. Heading the new office will be Frank R. Hunter, formerly sales representative in Allis-Chalmers' Kansas City, Mo., office since 1940. The office will be operated as a branch of the Kansas City office.

Material Handling Equipment Co., and **Baker-Raulang N. Y. Corp.,** manufacturers of industrial trucks and materials handling equipment, have merged to form the **Material Handling Equipment Co.,** with new headquarters at 141 East 44th St., New York. Officials of the new com-



(Left) Heading Lone Star Steel Co., Dallas, Texas, which put its new "pushbutton" cast iron pressure pipe foundry into operation in December is E. B. Germany, who until a few years ago was teaching in a country school a few miles down the road from Lone Star's new foundry. (Right) Lone Star's new foundry in operation—completed section of pipe is removed from mold by anchoring one end joint, shown at lower right, and moving mold away from anchor point. The cylinder containing the mold moves on rails.

pany are Lloyd Skougor, president; Nick Enello, service manager; and Herbert A. Cumming, Frank A. Babcock and Louis P. Bokanyi, sales engineers. The new organization will sell and service Baker Industrial Trucks, Moto-Trucs, Uni-Rak Pallet Systems and Beacon Dockboards.

The Aluminum Association, New York, at its Annual Meeting, January 23-25, in Louisville, elected A. P. Cochran, Cochran Foil Co., Inc., president, and re-elected A. V. Davis, Aluminum Co. of America, chairman of the Board, and Donald M. White, secretary and treasurer. J. P. Watry, Aluminum Casting and Engineering Co., Milwaukee, was elected chairman, and R. J. Roshirt, Bohn Aluminum & Brass Corp., Detroit, vice-chairman of the Association's Foundry Division. H. J. Hater, Aluminum Industries, Inc., was named to represent the Division on the Board of Directors.

Barrett-Cravens Co., Chicago, announces its merger with **Crescent Truck Co.,** Lebanon, Pa., manufacturers of industrial trucks and tractors since 1917. Crescent will henceforth be operated as a division of Barrett-Cravens, completing the Barrett line of floor level materials handling equipment from single-stroke, hand-lift trucks to high-lift electric fork trucks. All sales will be conducted from Barrett-Cravens' general offices at 4609 S. Western Blvd., Chicago, and manufacturing operations will be continued at Lebanon. No major changes in personnel are contemplated at this time.

Cope and Drag Club Elects

New officers elected at the quarterly technical meeting of the Cope and Drag Club are: *president,* Eugene Conreaux, Illinois Cereal Mills, Inc., Granite City, Ill.; *vice-president,* Jos. S. Schumacher, Hill & Griffith Co., Cincinnati; and *secretary-treasurer,* Eugene W. Smith, Western Materials Co., Chicago. They will take office at the next meeting of the group during the 55th Annual A.F.S. Convention in Buffalo, N. Y., April 23-26.

LETTERS

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lar structures. This may be due to effects on pearlite, or on ferrite, or on both. The annealed sample shown in Fig 11 has respectable elongation but relatively low strength, and this may be due to calcium having less effect on ferrite strength than has magnesium.

However, it is difficult to conceive how such small quantities of residual element could have much effect on ferrite strength, unless the grain boundaries are involved. It would seem worth while to repeat some of the work, using larger melts and keel-block type test coupons. Even with magnesium-treated nodular irons, the results obtainable on very small melts are much inferior to those obtained on larger melts under the same conditions.

J. E. Rehder, *Fdry. Eng.*
Dept. of Mines & Tech. Surveys
Ottawa, Ontario, Canada

PERSONALITIES

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Wally E. George, formerly accounting manager, Booz, Allen & Hamilton, Inc., Chicago, has been named president and general manager of Applied Arts Corp., Grand Rapids, Mich. Mr. George is a member of the A.F.S. Foreman Training Committee and has frequently spoken at A.F.S. Chapters on the subject of foundry cost control.

Russell F. LaBeau, formerly with the Ex-Cell-O Corp., has been named vice-president of Sutter Products Co., Dearborn, Mich., where he will take over engineering of new developments in automatic coremaking and foundry production equipment.

R. F. LaBeau

Gerald L. White, formerly with Westman Publications, Ltd., Toronto, Ont., Canada, as editor of *Canadian Metals,* is now editor of *Canadian Dairy and Ice Cream Journal,* Toronto. Mr. White, who has for many years been active in A.F.S. work, will continue his membership in the Society.

Richard E. Kerr, formerly chief metallurgist, Pettibone Mulliken Corp., Chicago, has been named to the staff of the metallurgical laboratory of Geneva Steel Co., Provo, Utah. Mr. Kerr has been active in the A.F.S. Steel Division, is a member of its Research Committee and secretary of its Program and Papers Committee. He is also a member of the Educational Division's Executive Committee and chairman of the Division's Graduate Industrial Training Committee.

William A. Roberts, executive vice-president in charge of Allis-Chalmers Mfg. Co.'s Tractor Division, was recently elected president of the company, succeeding the late **Walter Geist.** Other executive personnel changes were: **W. C. Johnson,** formerly executive vice-president in charge of general machinery division, to be company executive vice-president; **J. L. Singleton,** vice-president and director of sales, general machinery division, to be vice-president in charge of the division; **Fred Mackey,** formerly general works manager, general machinery division, to be vice-

president in charge of manufacturing, general machinery division; **R. S. Stevenson**, formerly general sales manager, tractor division, to be vice-president in charge of the tractor division; **A. W. Van Herke**, formerly director of engineering, tractor division, to be vice-president in charge of engineering, tractor division, and **John Ernst**, formerly general works manager, tractor division, to be divisional vice-president in charge of manufacturing.

Richard Westerman, one of the first men in the Toledo, Ohio, area to complete a five-year apprenticeship in patternmaking under the G. I. Bill of Rights, was honored February 7 at the A.F.S. Toledo Chapter's monthly meeting.

Richard E. Coe has been elected assistant to the president of Electric Furnace Co., Salem, Ohio. Formerly fuel engineer for the company, more recently he has been district manager for the North American Manufacturing Co.

A total of 142 years of service was rewarded recently by the presentation of wrist watches to five employees of the Federal Foundry Supply Co., Cleveland. President Ralph Ditty made the awards to **Dora Redecker**, 36 years; **Frank Suran**, 30 years; **George Donoghue, Sr.**, 27 years; **James Hasman, Sr.**, 26 years; and **William Alznauer**, 25 years' service.

New officers appointed by the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., are: **Robelt F. Rentschler**; vice-president assigned to special duties; **James M. Hoppenstall**, treasurer; and **Lester E. Leinbach**, secretary.

L. G. Graper, formerly superintendent of steel production for the Wisconsin Steel Works, a division of International Harvester Co., has been named technical advisor for the Lone Star Steel Co., Dallas, Texas, and is already on the job assisting with construction plans for Lone Star's new $73 million steel mill, which will produce oil pipe.

OBITUARIES

John Avery, since 1946 president of Roots-Connersville Blower Corp., Connersville, Ind., died of a heart attack January 13. A graduate of the United States Naval Academy in 1923, Mr. Avery was a member of General Electric Co.'s engineering staff for three years prior to becoming project engineer for Brown-Boveri Co., Switzerland, and a member of the staff of Allis-Chalmers Mfg. Co., Milwaukee. In 1932, Mr. Avery joined Roots-Connersville and during World War II was active in atomic work for the government.

Walter Geist, 56, president of Allis-Chalmers Mfg. Co. since 1942, died of a heart ailment January 29. Son of an immigrant Norwegian patternmaker, he left high school in 1909 to join Allis-Chalmers as a messenger boy at 10 cents an hour. While working there he took evening and extension courses at the University of Wisconsin's Milwaukee branch, becoming successively a tracer, draftsman,

engineer and assistant manager of the milling department. He then joined the sales department, becoming general sales representative for the general machinery division, and, later, division vice-president. In 1942, Mr. Geist was first elected executive vice-president, then president of the company. A member of many industrial, charitable and civic organizations, Mr. Geist was one of the nation's outstanding industrialists. He is survived by his widow, a daughter, Janet Lucille Bugni, and a son, Kenneth, director of purchases for Allis-Chalmers.

Leslie R. Taylor, 60, president of the International Heater Co., Utica, N. Y., died at his home in that city January 27. A graduate of James Milliken University, Mr. Taylor was with International Heater for 38 years, the first 23 of them in sales work. In 1928 he was named vice-president in charge of sales and in 1947 president of the company. A past president and director of the National Warm Air Heating and Air Conditioning Association, Mr. Taylor was a director of the Institute of Boiler and Radiator Manufacturers. During World War II, he served as a consultant to WPB.

Robert Crooks Stanley, 74, chairman of the Board of Directors, International Nickel Co. of Canada, Ltd., died at his home in Dongan Hills, Staten Island, N. Y., on February 12. Mr. Stanley became associated with one of International Nickel's predecessor companies in 1901 and in 1902 when the parent company was formed became assistant superintendent of the Camden, N. J., works. He was elected a director of the company in 1917, vice-president in charge of operations in 1918 and president in 1922. He was named chairman of the Board of Directors in 1937 in addition to his duties as president, which he relinquished in 1949. He was the recipient of many honors, including the ASM Gold Medal for Advancement of Research and the British Institute of Metals Platinum Medal.

Charles Clifford Rohrbach, who succeeded his father as secretary-treasurer of the Crucible Manufacturers Association in 1938, died December 22 in New York. A graduate of Stevens Institute of Technology and a veteran of World War I, Mr. Rohrbach had been active in the trade association field since 1933.

Reading Group Discusses High School Foundry Training

High school training for jobs in the foundry industry was advocated at the January 16 meeting of the Reading Foundrymen's Association, held at the Berkshire Hotel, Reading, Pa.

Citing the need for more men in the foundry and the opportunities for good jobs that exist there today, Mr. Sefing said most vocational and high schools have courses in electricity, carpentry, welding and similar crafts, but that few teach foundry. He urged members to invite high school classes to tour foundries to acquaint students with the industry and its products.

LITERATURE

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Parting Compounds

57—Six-page illustrated bulletin 427 outlines uses of Dag Colloidal Graphite as a parting compound in the foundry and in other industries. Dag is a colloidalized electric furnace graphite in an appropriate fluid carrier, that evaporates to create a thin graphoidal film that is unaffected by temperatures up to 3500 F and has a low coefficient of friction. *Acheson Colloids Corp.*

Portable Industrial Cleaner

58—4-page illustrated folder outlines features, specifications and operating characteristics of Hoffco-Vac No. 50, a super duty industrial portable cleaning unit that operates two 50-ft lines of 1½-in. hose simultaneously, or one 75 or 100-ft length of 2-in. hose. Unit is specifically designed for use where there are large dust accumulations, where continuous cleaning is necessary, or where superior separation is required to prevent exhausing dusts back into atmosphere. *United States Hoffman Machinery Corp.*

Electric Furnace Data

59—Data sheet contains information on typical electric furnace brick and refractories, including approximately minimum-maximum compositions, fusing temperatures and weights. Diagrammatic drawing shows positioning and composition of electric furnace brick and refractory components. Reverse side of data sheet lists standard sizes of plain cylindrical electrodes. *International Graphite & Electrode Corp.*

Cranes and Tramrails

60—Illustrated 4-page bulletin describes Ohio Tramrail line of cranes, transfer bridges and tramrail systems and shows numerous installation parts and details of parts. Featured in the bulletin is a complete story on the Ohio Tramrail Shielded Electrification System for motorizing cranes, bridges and tramrails. Available with bulletin are specification detail sheets which enable the methods or layout engineer to figure his plant's rolling live loads, weights and spans necessary to specify tramrail or crane installations. Also described are Beamrail and Teerail tracks. *Forker Corp.*

Refractories

61—12-page illustrated bulletin gives physical properties, compositions, applications and advantages of such small furnace refractories as fused alumina, silicon carbide, tubes, cores, muffles and cements; such large furnace refractories as fused alumina, fused magnesia, silicon carbide, brick, butner blocks and hearth plates; pure oxide refractories such as fused alumina and magnesia, fused stabilized zirconia, fused thoria, bricks and laboratory ware. Also described are kiln furniture, catalyst supports and porous mediums. *Norton Company.*

Index to Advertisers

A.F.S. Publications

A. F. S. Employment Service

To contact "Help Wanted" or "Position Wanted" advertisers, write to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, designating item number and issue of AMERICAN FOUNDRYMAN in which advertisement is published.

HELP WANTED

HW542—Research Metallurgist: Experience in melting and casting of metals desired. Familiarity with ferrous and non-ferrous alloys required. Experience in following important: vacuum melting and casting, melting and casting of titanium, gases dissolved in molten metals, and effect of vibration on solidification. Opportunity to do publishable research in well-equipped laboratory. Minimum education B.S. from well-rated university; doctor's degree desirable. High-grade experience may be substituted for advanced degree. Minimum working experience four years. Civil Service position.

HW557—Core Room Supervisor: Midwestern gray iron foundry desires experienced man capable of supervising production and assembly of small to medium-sized cores. Must be able to teach and coordinate making of cores on benches and coreblowers. In replying, please state age, experience and salary expected.

HW559—Metallurgical Engineer; to take charge of all melting, sand control and laboratory in Midwestern malleable foundry.

POSITIONS WANTED

PW154—Plant Manager or Superintendent. Twenty-eight years of gray iron experience. Excellent practical training. Eighteen years in executive capacity. Experienced in production and jobbing, mechanized or non-mechanized. Age 47. Excellent character and references.

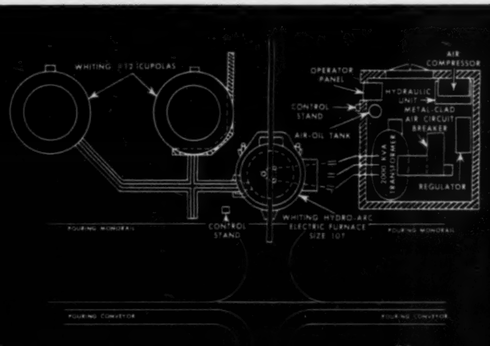
PW155—Foundry Engineer: Permanent mold, aluminum and magnesium—25 years experience in all phases estimating, designing, break-in, foundry control, production, and sales engineering. Age 43, available immediately.

PW158—Metallurgist: Seventeen years experience in metallurgical control, research and development on ferrous and non-ferrous alloys. Presently employed as Chief Metallurgist supervising sand control, gating, heat treatment, metallurgical quality control, and development in one of the largest non-ferrous foundries specializing in light alloy castings such as jet engine parts, etc. Experienced in trouble shooting, consulting work, and as executive. Desires responsible position with greater future possibilities. Age 38. Married.

Duplexing installation in which hot metal is carried to the Hydro-Arc Furnace with a ladle.

Cupola-to-Electric DUPLEXING

— a solution to low-quality coke problems



Typical cupola-to-electric duplexing layout complete with pouring system

By using a Hydro-Arc Furnace that matches total cupola capacity, melters are increasing production, getting proper pouring temperatures at all times, and reducing machine shop rejections.

Other savings (such as continuity in pouring, increased yield from alloys, and finer grain castings of higher strength) help to make cupola-to-electric duplexing repay its entire cost in a comparatively short time.

The versatility of Hydro-Arc Electric Furnaces, combined with the ingenuity of Whiting engineers, make this equipment adaptable to almost any foundry requirements. A Whiting representative will gladly call to discuss it with you.

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